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This report documents the Strategic Mobility 21 (SM21) program transition from a Research Federation to a Business Enterprise. Over a period of six years, the SM21 Research Federation has focused on the development of two concepts: the Joint Deployment and Distribution Support Platform (JDDSP) as an advanced global distribution network; and, the Joint Logistics Education Training Transformation (Test-bed) (JLETT), a concept designed to support logistics education and training .

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Strategic Mobility 21

Strategic Mobility 21 Transition Plan: From Research Federation to Business Enterprise

Contractor Report 0022

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Table of Contents

List of Figures

List of Tables

Abstract

This report documents the Strategic Mobility 21 (SM21) program transition from a Research Federation to a Business Enterprise. Over a period of six years, the SM21 Research Federation has focused on the development of two concepts: the Joint Deployment and Distribution Support Platform (JDDSP) as an advanced global distribution network; and, the Joint Logistics Education Training Transformation (Test-bed) (JLETT), a concept designed to support logistics education and training[1].

Beginning in December 2010, the JDDSP management will be transitioned to Strategic Mobility 21 Incorporated (SM21 Inc.) operating as a not-for-profit entity. Over time SM21 Inc. will evolve into a 4th Party Logistics Provider to manage the JDDSP deployment while providing logistics education and training through the JLETT.

The primary transitioning concept - the JDDSP- includes "smart nodes," generally defined as regional, multi-modal transportation terminals, which will be connected by intelligent arcs that form smart and secure trade corridors. Within the Department of Defense (DoD) logistics environment, the JDDSP would support the Joint Deployment and Distribution Enterprise (JDDE). In the commercial sector, components of the JDDSP would initially support small to large supply chain "deliver" functions; however, in the future could expand into other supply chain logistics functions. The initial operating capability of the JDDSP is the Global Transportation Management System (GTMS), which was developed with Dole Packaged Foods as a joint experiment.

The development of the JDDSP and JLETT were structured to take place within a multi-phase project designed to evaluate, develop, and implement solutions to challenges facing dual-use distribution networks: that is, transportation networks that are useful for military and commercial sectors. While the basic JLETT concept and the JDDSP initial operating capability were completed by the Research Federation, the continued development of the JDDSP and the JLETT will take place after SM21 completes the transition process to a Business Enterprise.

The JDDSP IOC, which is the GTMS development supported by Dole Foods, was based on Service Oriented Architecture (SOA). The SOA enables the program to use the Internet as an Enterprise Service Bus where various systems exchange data using standard protocols. The GTMS was developed for use by both the commercial and military sectors in the Software-as-a-Service (SaaS) format, whereby users access the application with the appropriate Internet authorizations. Security is provided by standard protocols used on the Internet that have been successful with secured applications. The deployment of the GTMS to the military operating environment is being planned through a Joint Capability Technology Demonstration (JCTD).

[1] The JLETT transition is more fully documented in a separate technical report submitted and approved by ONR as follows: Strategic Mobility 21 Transition Plan Revised Annex B – Joint Logistics Education and Training Experimentation Testbed, in fulfillment of the requirements for FY06/07 Contract No. N00014-06-C-0060, CLIN 0022, April 2, 2010.

1.0 Introduction

This Technical Report defines the Strategic Mobility 21 (SM21) program's transition from a funded Department of Defense (DoD) Research Federation to a dual commercial and military use (dual-use) Business Enterprise. The primary objective of this report is to document the major transition processes established to "actualize" the SM21 Vision. The transition path established by the SM21 Research Federation is highlighted in Figure 1 – Achieve Strategic Advantage.

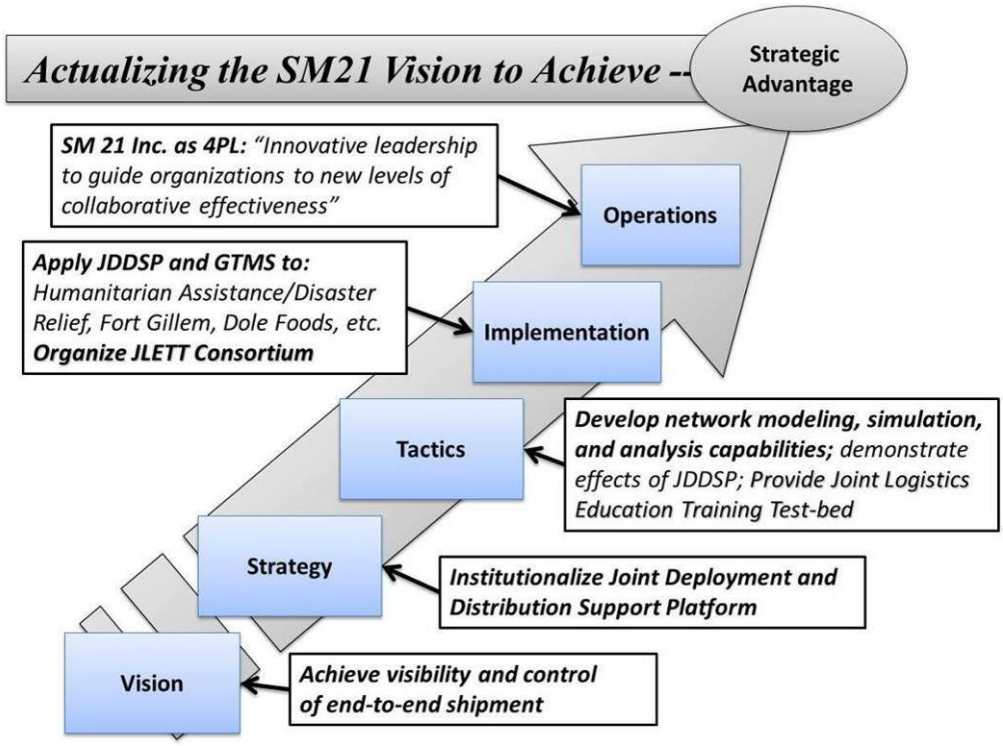

Figure 1 – Achieve Strategic Advantage

The SM21 Research Federation technology transition process will continue after the California State University Long Beach (CSULB) Foundation SM21 Research Federation is closed out during December 2010. Under the CSULB Foundation structure the SM21 Research Federation was able to complete the first three steps outlined in Figure 1: Vision, Strategy, and Tactics. The fourth step, Implementation, was initiated by the SM21 Research Federation and will continue through joint efforts by the CSULB Foundation's Center for the Commercial Deployment of Transportation Technologies (CCDoTT) and the SM21 Inc. Business Federation. The commercial transition efforts will continue under the management of the SM21 Inc. Business Federation; specifically, Level Six Logistics LLC. Over time SM21 Inc. will evolve into a 4th Party Logistics Provider to manage the JDDSP dual-use deployment.

Figure 2 provides a general overview of the SM21 program under the CSULB Foundation supported Research Federation. The figure summarizes the "who, why, what, and how" of SM21 and the primary transition elements. Each of the program elements

have been overviewed in the SM21 Final Report[2] and are discussed within this report in the context of the transition process.

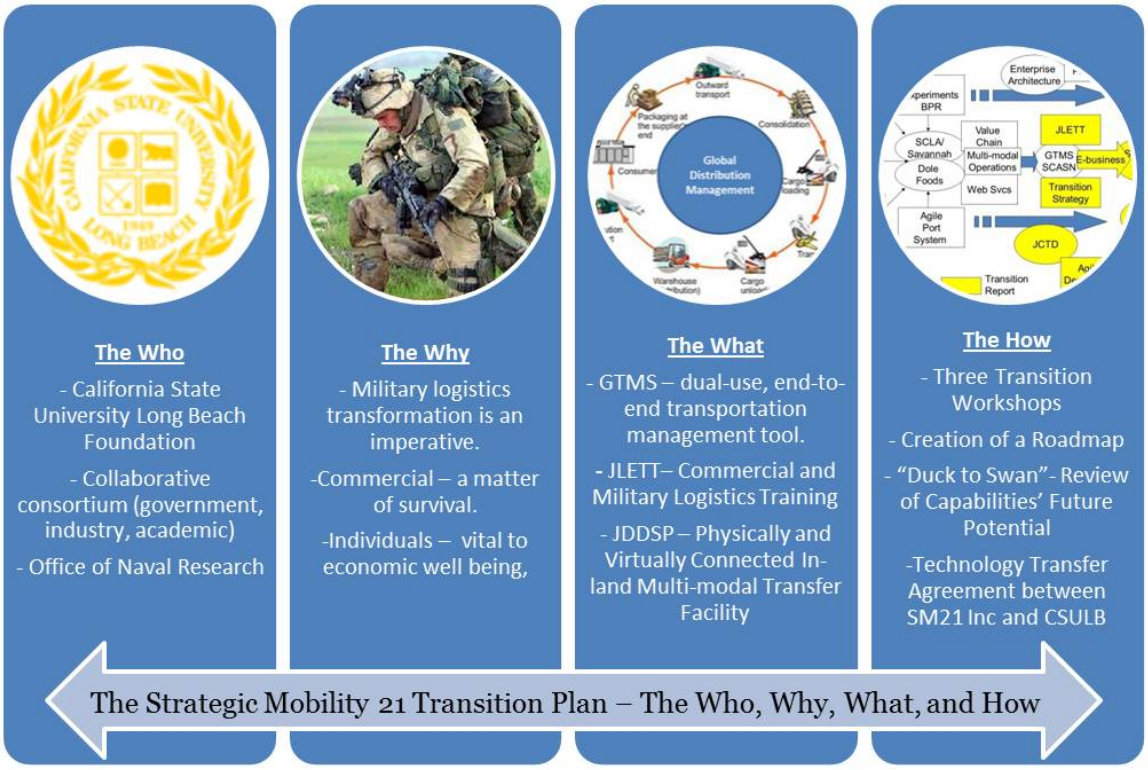

Figure 2 – Strategic Mobility 21 Program Elements

The near term military transition efforts will have split responsibility between the SM21 Business Federation and a CCDoTT sponsored project to establish a Joint Capability Technology Demonstration (JCTD). The planned JCTD would demonstrate the most mature SM21 transitioning technology – the Global Transportation Management System (GTMS) supporting a Humanitarian Assistance/Disaster Relief operation during a Combatant Command Joint Training Exercise.

The dual-use GTMS and the supporting modeling and simulation capabilities comprise the initial operating capability (IOC) of the Joint Deployment and Distribution Support Platform (JDDSP). This technical report defines the transition process for the JDDSP concept, the JDDSP IOC operational systems, and the Joint Logistics Education and Training Experimentation Test-bed (JLETT). Both the JDDSP and the JLETT are summarized in this report. Additionally, the report outlines the establishment of a non-profit entity, Strategic Mobility 21 Inc., which will provide the organizational structure and leadership needed to transition the technology developed by the current SM21 Research Federation and to establish the future Business Enterprise.[3]

[2] Mallon, Lawrence, Strategic Mobility 21 Final Report, in fulfillment of the requirements for FY06/07 Contract Number N00014-06-C-0060, CLIN 0022, December 10, 2010.
[3] The SM21 program is currently considered a Research Federation consisting of the California State University Long Beach (CSULB) Foundation, the Office of Naval Research, and the Collaborative

2.0 Program Transition Elements: The Who, Why, and What

Over a period of six years, the SM21 Research Federation has focused on the development of the Joint Deployment and Distribution Support Platform (JDDSP) as an advanced dual-use logistics concept. The JDDSP concept will be transitioned to SM21 Inc. operating as a not-for-profit entity for continued development and experimentation. The JDDSP concept includes "smart nodes," generally defined as regional, multi-modal transportation terminals, which will be connected by intelligent arcs or trade corridors. Within the Department of Defense (DoD) logistics environment, the JDDSP would support the Joint Deployment and Distribution Enterprise (JDDE). In the commercial sector, components of the JDDSP would support small to large supply chain "deliver" functions.[4]

During the same six year period as the JDDSP development, the Joint Logistics Education Training Transformation (Test-bed) (JLETT) was established to support commercial and joint military logistics education, training, and experimentation. The JLETT transition is documented in a separate technical report submitted and approved by ONR[5] and is overviewed in this report.

2.1 The Joint Deployment and Distribution Support Platform - JDDSP

The JDDSP concept is the principal legacy of the SM 21 Research Federation and was developed after extensive commercial and military research and development associated with several projects including the CCDoTT Agile Port System (APS). The APS was a ten year joint research and development project supported by the CSULB CCDoTT program and US Department of Transportation Maritime Administration (MARAD). The JDDSP was designed to be the dual-use inland multi-modal transfer facility supporting APS. Figure 3 provides an overview of a Regional JDDSP. Appendix B introduces the next phase in the JDDSP development – the Evolution to a Future Global Distribution Management System or GDMS.

The JDDSP links an agile marine terminal either physically via a dedicated corridor or virtually via a regional web network with the inland multi-modal facility, creating an efficient monitored distribution lane. One or more regional JDDSPs linked by "intelligent" road and rail links comprise an agile supply network (ASN). The transportation arc between the agile marine terminal and the JDDSP could be developed as a smart and secure trade corridor (SSTC). SM 21 defines a smart secure trade corridor or SSTC as an actively monitored, technology-verified, Customs-Trade Partnership against Terrorism (C-TPAT) Level 3 trade lane providing services for multiple shippers.

consortium of government, industry, and academic entities. The Business Entity has been named Strategic Mobility 21 Incorporated or SM21 Inc.

[4] In the future the JDDSP may also begin to support the other functions of supply chain management,

[5] Enterprise Management Systems, Strategic Mobility 21 Transition Plan Revised Annex B – Joint Logistics Education and Training Experimentation Testbed, in fulfillment of the requirements for FY06/07 Contract No. N00014-06-C-0060, CLIN 0022, April 2, 2010.

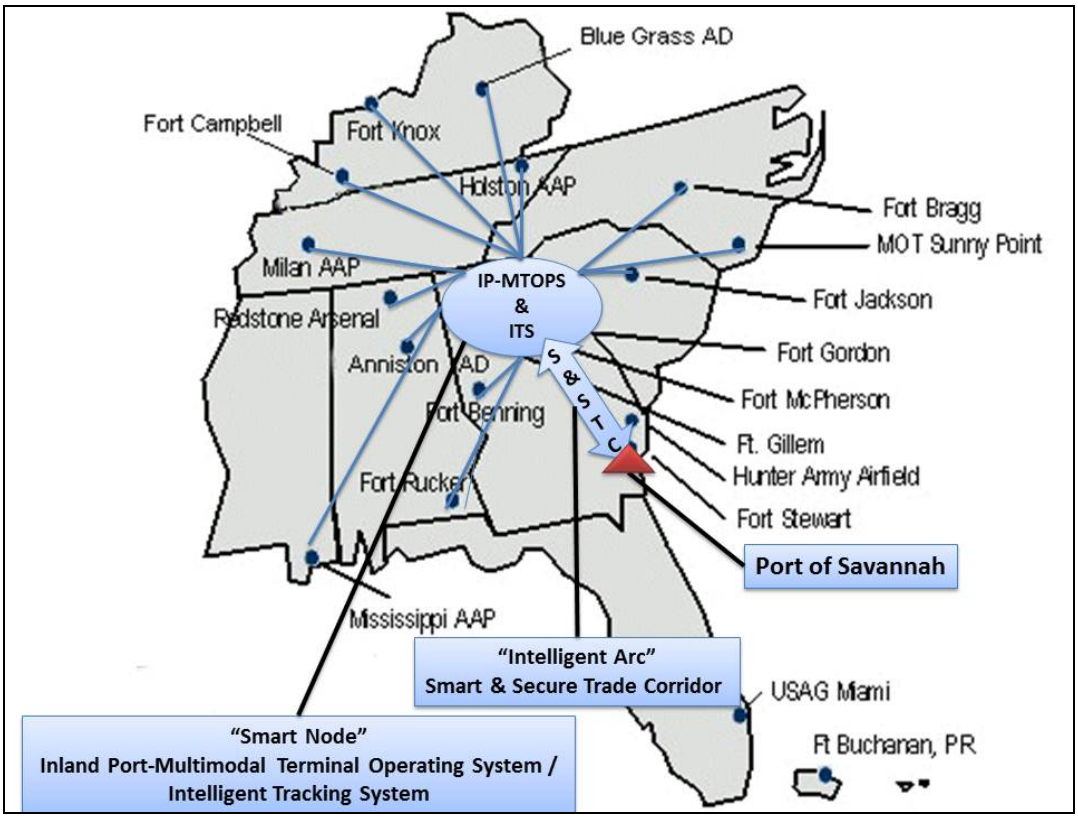

Figure 3 – Regional Joint Deployment and Distribution Support Platform

2.2 JDDSP Concept Capabilities

For DoD purposes, a JDDSP is an integrated physical services/information node capable of integrated support with the DoD Joint Deployment and Distribution Enterprise (JDDE). The DoD JDDE is an integrated system consisting of assets, materiel, personnel, leaders, organizations, tools, training, facilities, and doctrine capable of providing prospective joint force commanders with the ability to rapidly and effectively move and sustain joint forces in support of major combat operations or other joint operations. The JDDE stakeholder organizations consist of: the Office of Secretary of Defense, Joint Staff, Combatant Commands, Military Services, Defense Agencies, and Transportation Component Commands.

The JDDSP, as described in the JDDSP Initial Concepts Document (ICD), includes the Integrated Tracking System (ITS) and Inland Port – Multi-modal Terminal Operating System (IP-MTOPS). Multiple JDDSP facilities would be linked by the dual-use Global Transportation Management System, which represents the IT SOA backbone and first web service capability under the JDDSP. The JDDSP-Network design is overviewed in Figure 4.

An overview of the JDDSP Concept functionality follows:

- The JDDSP provides:
  - Integration/consolidation/marshaling point for sustainment and joint force deployment,
  - Future support for the Joint sea-basing concept, and

- Pre-staging area for global humanitarian assistance/disaster relief-HA/DR
- A regional physical, information planning, execution, and secure repository node in the national and global logistics network through public-private partnership integration (P3).
- An integrated physical, information node in commercial distribution systems and global distribution network.
  - Multi-modal freight terminal supporting a regional goods movement network.
  - Supported by a regional intermodal/multi-modal rail facility.

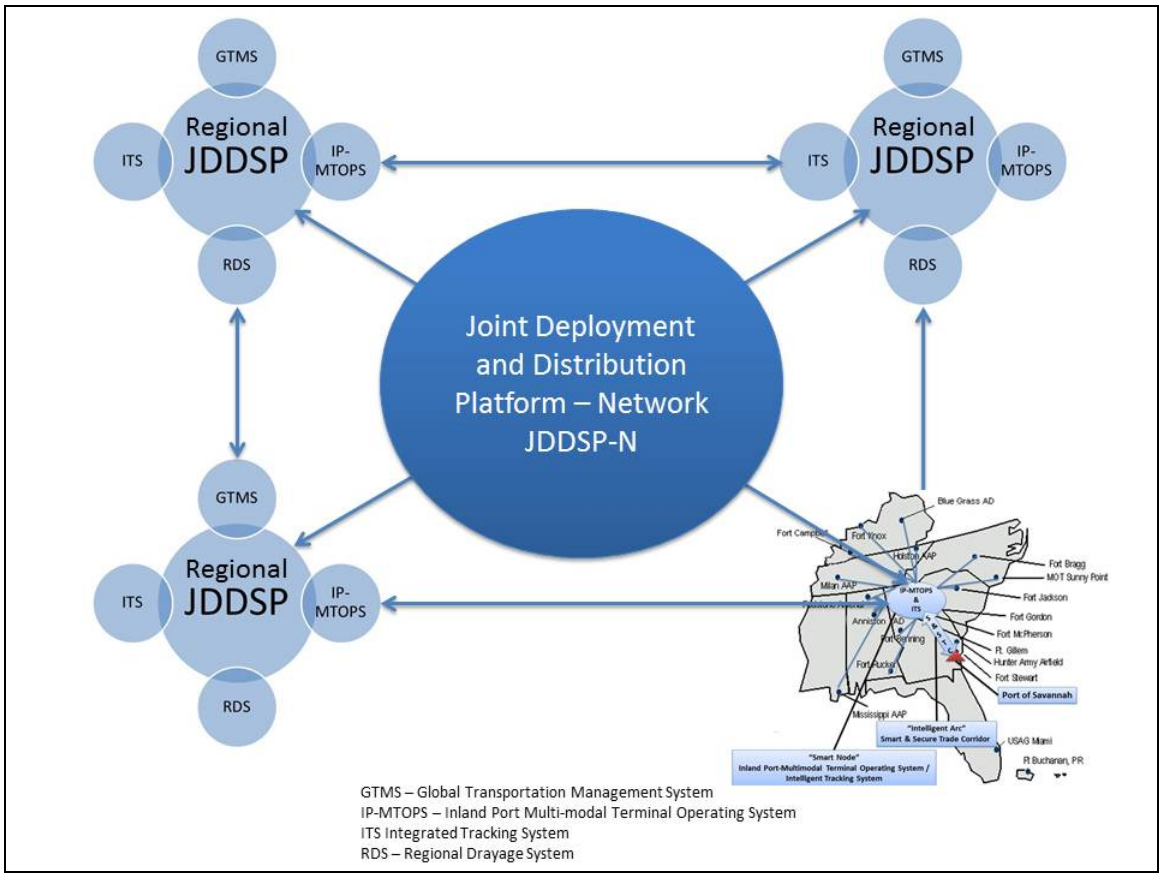

Figure 4 – JDDSP Network

2.3 Potential JDDSP Locations

Initially the focus for potential JDDSP locations centered on Southern California; however, suitable venues for JDDSP physical experimentation are also available in the Southeast where multiple military installations are located and unit movements frequently occur through multiple strategic seaports (Charleston, Savannah, Blount Island Jacksonville, Port Canaveral and Houston).

Two additional venues presented themselves during the Phase II segment of the SM 21 program: (1) the 2011 prospective closure of Fort Gillem near Hartsfield-Jackson International Airport south of Atlanta, Georgia; and (2) Former NAS Cecil Field-Commerce and Blount island-Jacksonville, Florida. Each venue offers unique

opportunities to deploy modeling and simulation support capabilities, along with a regional collaborative web service portal incorporating the GTMS. The potential also exists to develop the prototype JDDSP Inland Port - Multi-Modal Terminal Operating System (IP-MTOPS) and Integrated Tracking System (ITS) system at Fort Gillem. There are additional opportunities to integrate the Fort Gillem JDDSP with Hartsfield Airport, the Port of Savannah, and Cecil-Commerce with the dual-use port of Blount Island-Jacksonville.

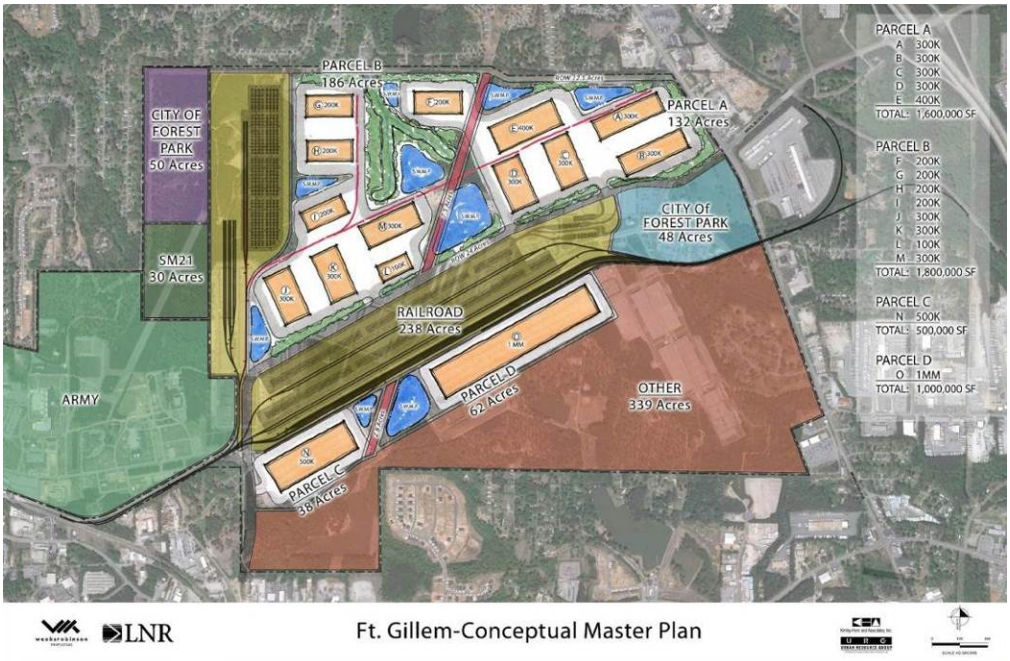

Figure 5 – Fort Gillem – Conceptual Master Plan with SM 21 Space Reservations

Significant long term opportunities exist in the Southeast for the full development of the JDDSP regional support concept. With the potential opportunities at Fort Gillem and Ceil-Commerce, the dual-use JDDSP functional capabilities can now be prototyped in both a commercially significant and militarily relevant environment. See Figure 5 – Fort Gillem – Conceptual Master Plan with SM 21 Space Reservations.

2.4 The Global Transportation Management System

The initial operating capability of the JDDSP is the Global Transportation Management System (GTMS), which was co-developed with Dole Packaged Foods. The GTMS has completed two User Acceptance Tests (UAT) and an extended user trial period by Dole Packaged Foods.

As background, mature, best-of-breed Transportation Management Systems (TMS) are software solutions that facilitate the procurement of transportation services; the short-term planning and optimization of transportation activities, assets, and resources; and the execution of transportation plans. They address all modes of transportation, including Ocean, Air, Rail, Full Truckload, Less-than-Truckload, Parcel, and Private Fleet. In addition to managing the physical flow of goods, they also manage the flow of transportation-related information, documents, and money. TMS also include

performance management and collaboration capabilities. The SM21 Research Federation expanded the scope of a typical TMS to encompass global dual-use, optimized transportation management services.

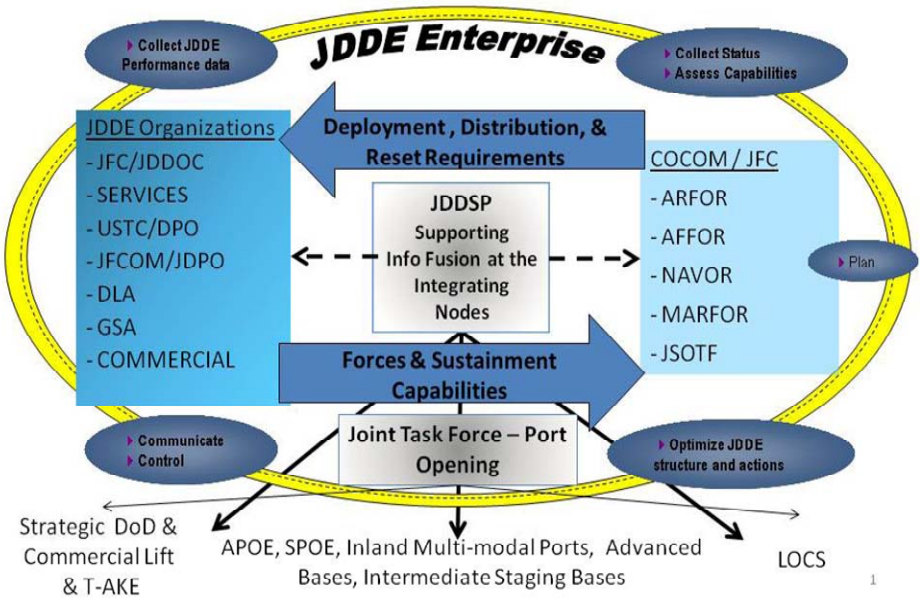

Figure 6 – Information Fusion Node Capabilities of JDDSP

The current GTMS is a low risk, high-value transitional product created by integrating best-of-breed dual-use systems deployed in the software as a service (SaaS) environment. It includes single sign-on capabilities and was designed for integration with corporate enterprise resource planning (ERP) systems. The GTMS supports the supply chain logistics "deliver" function at the execution level. After full implementation, the GTMS integrated with a corporate ERP will enable the enterprise to maintain the optimal flow of inventory from source to store shelf. The GTMS offers enhanced nodal optimization services for item level inventory shipments.

From an SM 21 Inc. Business Federation long term program perspective, the GTMS is a transitional proof of concept and market entry system employing a primarily transaction based revenue model. The GTMS development will continue after transition by the SM21 Business Federation and in the future could utilize a combination of transactional, subscription, and value based revenue models. Future GTMS development is dependent on the success of the current GTMS transition and deployment in the commercial sector. Current planning includes preparing the GTMS for integration with the Dole Foods enterprise resource planning system – SAP during 2011.

An overview of the GTMS co-developed with Dole Packaged Foods is provided in Figure 7 – The Global Transportation Management System. Figure 8 – Data Integration Model - provides an overview of the current data sources being processed by the GTMS.

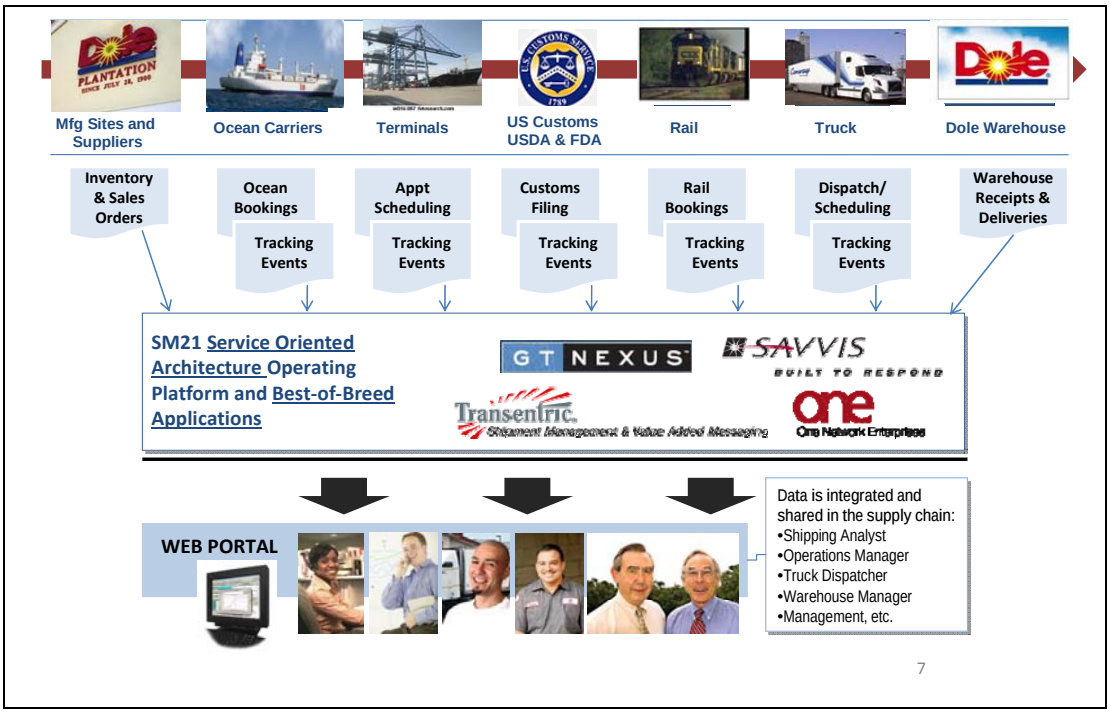

Figure 7 – The Global Transportation Management System

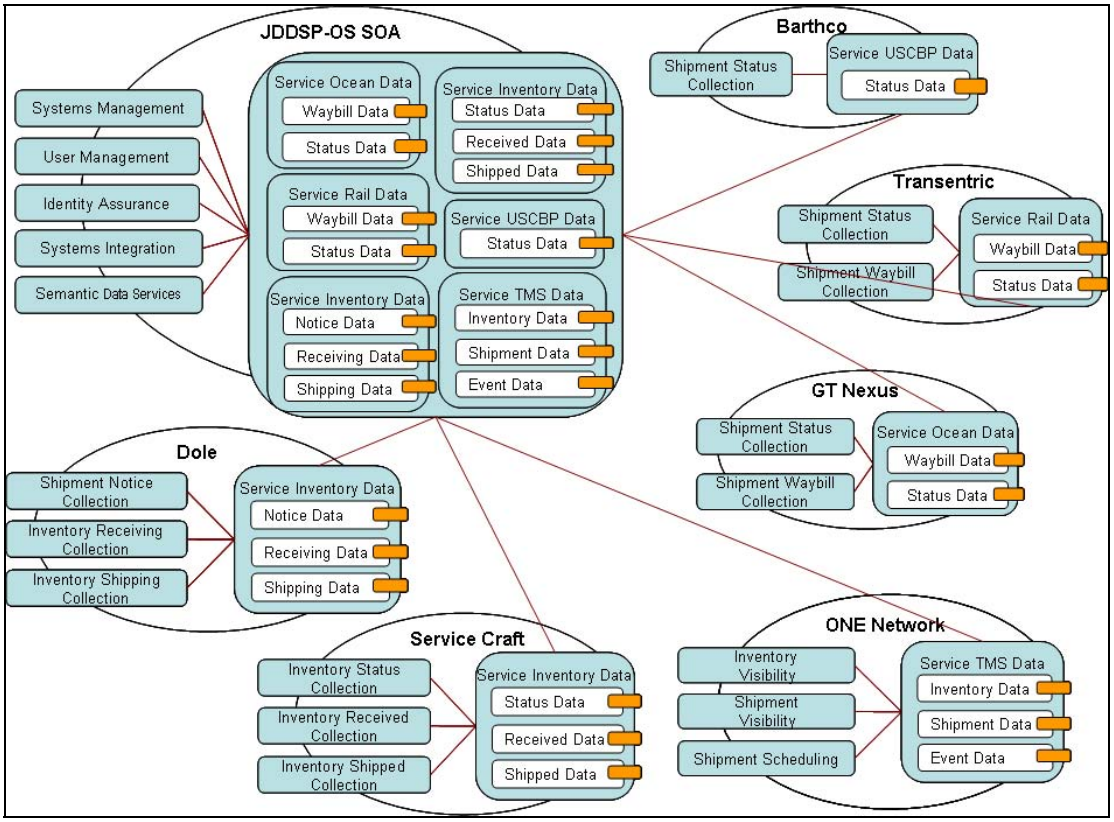

Figure 8 – Data Integration Model

2.5 The Joint Logistics Education & Training Experimentation Test-bed (JLETT)

The future transition of the Joint Logistics Education and Training Experimentation Test-bed (JLETT) is the second major element of the SM21 Inc. Business Enterprise transition plan. The complete transition process is documented in the *Strategic Mobility 21- Joint Logistics Education and Training Experimentation Test-bed (SM21-JLETT): The Transition Process*, the JLETT transition technical report, which was submitted and is now an Office of Navy Research (ONR) approved deliverable under the SM21 Research Federation program. Appendix D – Human Capital Development provides information on additional capability that will be included in the SM21 Business Enterprise JLETT. The modeling, simulation, and analysis (MSA) capabilities developed by the SM21 Research Federation will also transition as an element within the JLETT as described in this report.

2.6 Overview of the JLETT Transition

The lessons learned and relearned from the Revolutionary War to the more recent experiences in Afghanistan, Iraq, and the responses to recent complex humanitarian disasters emphasize just how critical distribution logistics is to operational success. In modern warfare Combatant Commanders (CCDRs) rely on Joint Logisticians to be subject matter experts (SME). More importantly, Joint Logisticians must be critical thinkers with the ability to rapidly access requirements, adapt to dynamic environments, discern shortfalls, and develop sufficient solutions to support requirements within the Joint context. Despite the critical nature of logistics, it is often neglected, especially in the training of Joint Logisticians and during major Combatant Command (COCOM) exercises.

One of the SM21 Research Federation members was tasked[6] with assisting in the planning and execution phase of establishing the Joint Logistics Education and Training Experimentation Test-bed (JLETT). The SM21-JLETT was established to support the training and education of commercial and military logisticians. The focus of the SM21-JLETT transition planning is the 2009, Joint Logistics Education, Training and Exercise Study (JLETES) completed by an SM21 Research Federation corporate member for the Joint Forces Command (JFCOM) J7.

The FY 2008 Department of Defense (DOD) Appropriations Bill provided the funding to conduct the independent JLETE study on the effectiveness and efficiency of Joint logistics education and training in the COCOMs and Joint training exercises. USJFCOM sponsored the study through the Joint Warfighting Center/Joint Training Directorate (JWFC/J7). The JLETES gave an overall assessment of the current state of Joint logistics education and training in DOD.

Various methodologies were employed in completing the study. To begin, ten logistics education related studies were selected and analyzed. Next, the Joint logistics lessons learned from several sources were reviewed, as well as COCOMs' exercise after-action reports (AAR) and the results of USJFCOM's Multinational Experiments. An important

[6] Statement Of Work Revision D, Title: Strategic Mobility 21 FY06/07, Date: February 1, 2010, S07-338108EMS (02/01/2010-04/30/2010); Task 4.2 JLETT Transition Planning and Execution

aspect of the study was the interviews conducted with Subject Matter Experts (SMEs) from USJFCOM, United States Transportation Command (USTRANSCOM), and several educational institutes. A survey was also conducted with the COCOMs to gather additional data and requirements. Concurrently, a review of logistics education and training courses was conducted and a database with over 800 entries was created. Lastly, technologies related to logistics training and education was assessed.

The JLETES study identified over 40 findings and recommendations which were used as the basis to develop the SM21-JLETT Transition Plan. The opportunity exists for the SM21 Business Enterprise to help eliminate, or at least lessen, the numerous causes that revolve around a number of specific logistics Joint training and education issues and shortfalls in exercises and Joint planning skills.

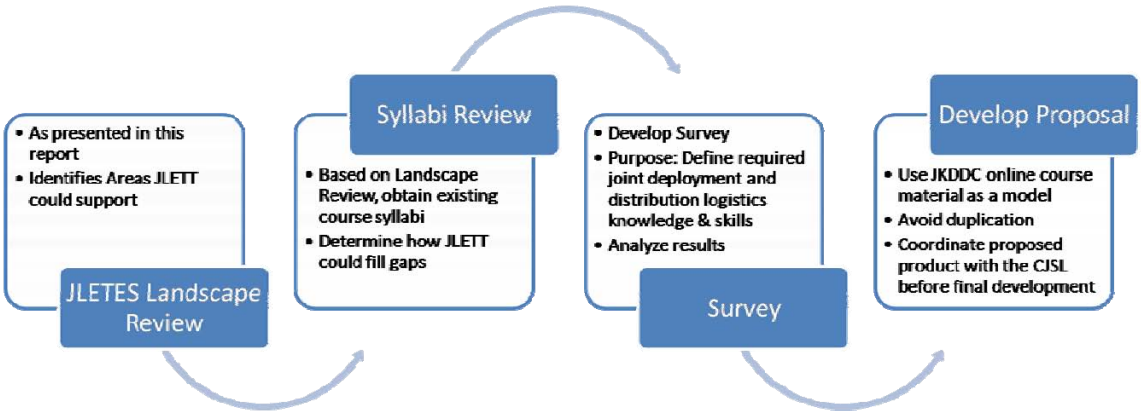

Figure 9 – Joint Distribution Logistics Education & Training Capability Development

Working with the Center for Joint and Strategic Logistics (CJSL), the SM21 Business Enterprise will be able to identify validated training requirements for continued education and training support development using the steps outlined in Figure 9 – Joint Distribution Logistics Education & Training Capability Development. The process leading to a final support proposal to the CJSL is further defined in the following sections.

2.7 Potential Joint Logistics Education and Training Support

To begin the transition planning, the SM21 Research Federation examined the JLETES Findings and Recommendations and the completed Joint Logistics Education and Training Landscape analysis. The landscape analysis was reviewed to isolate the available joint logistics training and education programs related to joint force deployment, redeployment, retrograde, reset, and sustainment distribution. The review revealed that out of the 555 Joint Logistics courses in the landscape, 187 cover the subjects the SM21 Business Federation could support.

Many of the applicable courses and training programs identified cover multiple subjects. Although a limited number of the offered courses covered all of the topics, some only covered redeployment and sustainment operations, while others focused on joint deployment and redeployment. Many of the courses which examined sustainment distribution activities also touched on the subjects of retrograde and reset.

The JLETES revealed that there are only a few logistics education and training courses related to the Joint Capabilities Areas of redeployment and retrograde. The study made two recommendations to address this gap:

- Explore adding redeployment planning and retrograde operations training to Service/Joint Schools and specifically to joint logistics courses.
- Establish retrograde training and operations in large scale training exercises at joint and service training centers or as part of large scale redeployment CPXs.

When established, the SM21 Business Enterprise support program could create and provide education and training in order to fill these gaps. These courses could cover the subjects of Joint Deployment, Redeployment, Retrograde, Reset, and Sustainment Distribution. Prior to developing education and training programs for these subjects, the SM21 Business Enterprise will submit a support plan to the Center for Joint and Strategic Logistics (CJSL) staff, USJFCOM J-7 or, USTRANSCOM depending on the subject, for review to validate that the SM21 Business Enterprise development support would be appropriate.

Additional targets of opportunity for the SM21 Business Enterprise would be Joint Deployment and Sustainment Distribution associated specifically with Irregular Warfare, Humanitarian Assistance, and Disaster Relief, which have little, if any, associated training or education available. The deployment and sustainment support for Irregular Warfare, Humanitarian Assistance, and Disaster Relief is very different than that of conventional military operations normally taught in logistics courses. The opportunity exists for the SM21 Business Enterprise to develop logistics education and training tools that are capable of providing realistic logistic training for scenarios involving Irregular Warfare, Humanitarian Assistance, and Disaster Relief.

3.0Modeling and Simulation

The Strategic Mobility 21 (SM21) Research Federation worked extensively on creating new concepts for improving transportation related network modeling, simulation, and analysis (MSA) capabilities. The SM21-MSA program was created to improve the end-to-end planning for the “delivery” function of both military and commercial supply chains and collaborative regional transportation planning. The SM21 team used both a commercial and academic approach in developing the MSA program. From the commercial sector, previous modeling and simulation works were analyzed, as well as commercially available modeling and simulation programs. The SM21 program enlisted the academic sector to perform experiments using the latest advances in modeling and simulation. The SM21 program maintained a collaborative environment between the academic and commercial teams. Figure 10 – SM 21 Modeling and Simulation Tools – provides an overview of analytical tools developed by both the commercial and academic research partners.

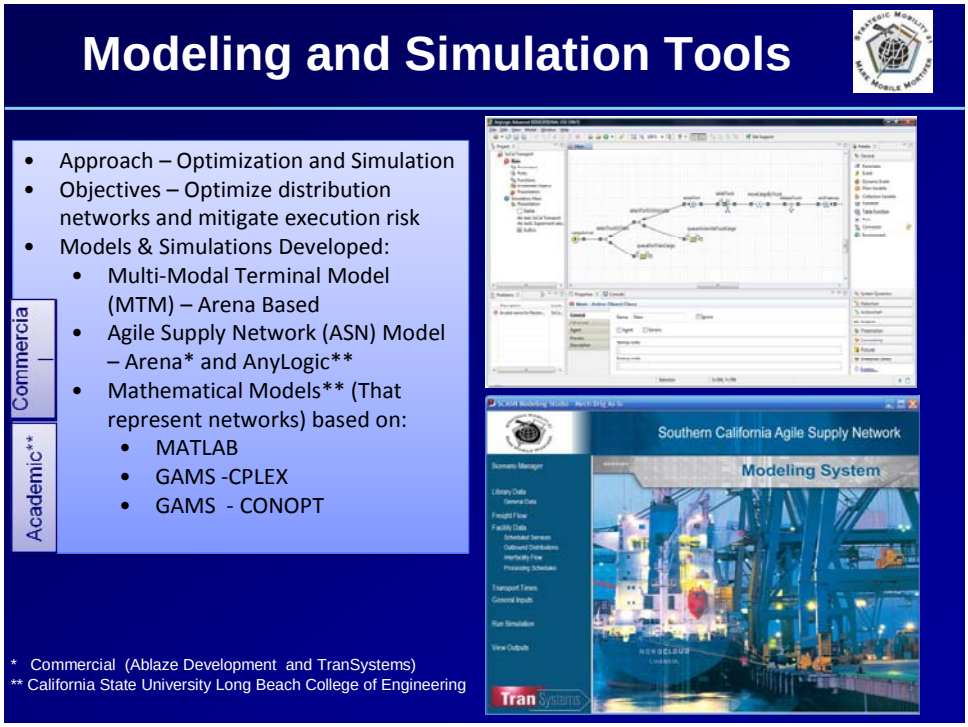

Figure 10 – SM 21 Modeling and Simulation Tools

The complete transition strategy for the modeling and simulation efforts completed by the SM21 Research Federation is contained in the *Strategic Mobility 21 - Modeling, Simulation, and Analysis*, Technical Report, dated April 14, 2010. The technical report is divided into two sections. The first section examines the work completed by the commercial sector and the commercially developed modeling and simulation tools. Examined are reports developed for SM21 based on the TranSystems SCASN model, including the Trade Corridor Gap Analysis and the Simulation Analysis Report.[7] The latter validates the SCASN model while also evaluating the JDDSP concept. The Trade Corridor Gap Analysis describes the use of the SCASN Modeling Application for modeling the four major trade corridors within California. The Multi-Modal Terminal model was developed for SM21 by Ablaze Development to design multi-modal terminal operations with a focus on refining the JDDSP concept. The first section of the report concludes by examining the future of military force deployment modeling through the use of a web-based Force Deployment Scheduling Solution. The beta solution was developed by the academic program team using AnyLogic, which is a Java programmed, multi-method simulation modeling tool developed by XJ Technologies.

[7] The commercial models were created as a family of models built on the same Arena-based simulation platform. The models have the capability of sharing input and output data and dynamic routing algorithms.

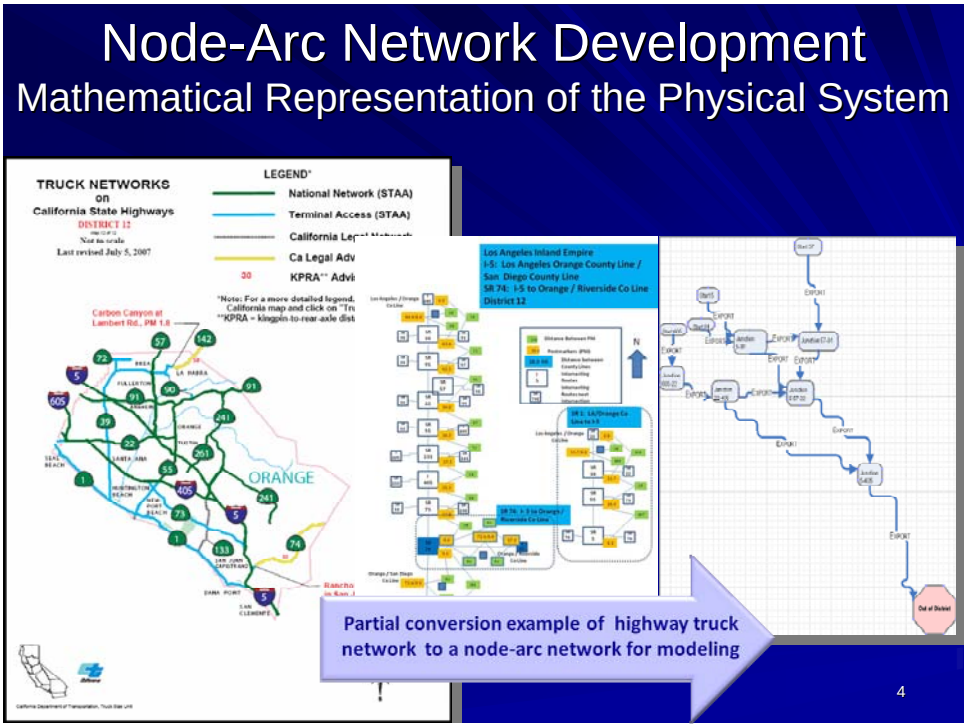

Figure 11 – Node-Arc Network Development

The second section of the technical report supports the SM21 transition process by documenting the academic side of the SM21-MSA program. The academic program used a dual modeling approach focused on simulation and optimization, and it used models that were generic, data driven, and flexible. Two modeling subtasks were undertaken to develop modeling capabilities for goods movements through a regional agile supply network. These subtasks were the conversion of the optimization model from MATLAB to GAMS/CPLEX, and a similar conversion of the simulation model from an Arena platform to an AnyLogic based Web Service. MATLAB is useful for small problems with few nodes, but GAMS/CPLEX is better able to efficiently solve more complex problems. The choice of converting from Arena to the AnyLogic Web Service occurred for a similar reason. The Arena platform did not allow for easy integration of the SCASN model into a Service Oriented Architecture; however, the Java-scripted AnyLogic tool allowed for an easy integration through the conversion of SCASN to a web service.

Figure 11 – Node-Arc Network Development – depicts the generic regional Agile Supply Network Model ©, a mathematical representation of the physical system of systems with logical (e.g. business rules) and physical elements capable of using live and archival data fusion. The network is built upon a server-queue dispatch model and all of the characteristics and attributes for each of the nodes (marine terminals, intermodal rail ramps, warehouse and distribution and trans-loading facilities and JDDSP) and arcs (major rail and road corridors).

Figure 12 – Post Transition Integration of Models and Simulations – overviews the future concept of an integrated Agile Supply Network model. The model could be

based on the AnyLogic application and made available as a web service by the SM21 Inc. Business Enterprise.

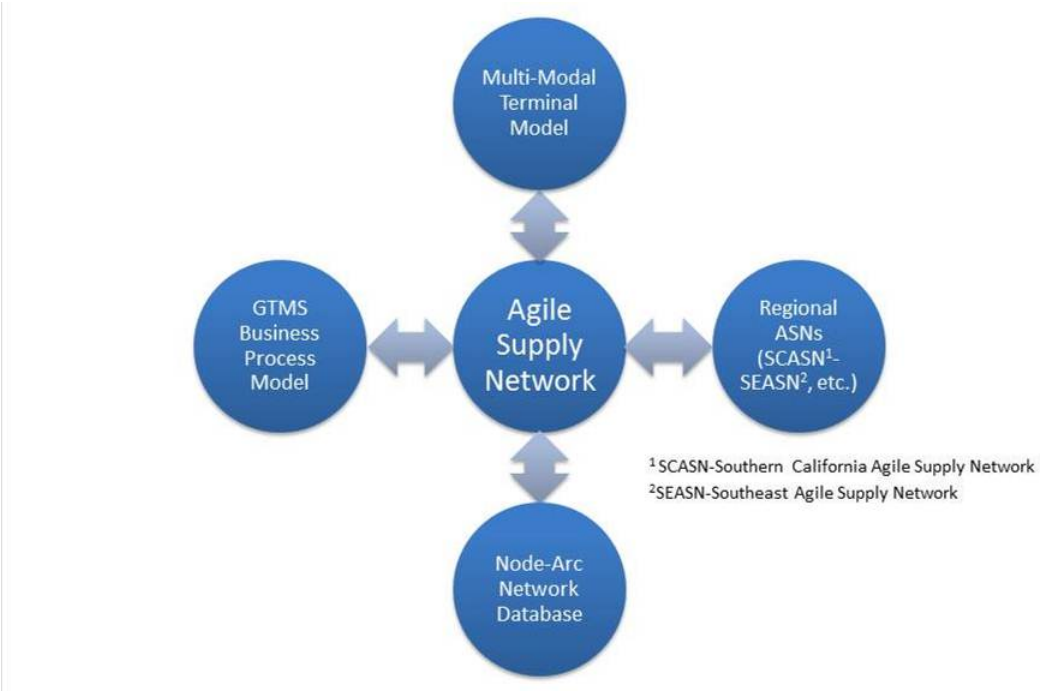

Figure 12 – Post Transition Integration of Models and Simulations

4.0 Technology Development Method and Documentation: The How

The SM21 Research Federation JDDSP development program employed best commercial practices to enhance the potential for dual commercial and military use. Dole Foods worked as an integral team member in the development of the JDDSP Global Transportation Management System (GTMS), the end-to-end transportation management system that will support the JDDSP. Additionally, the processes established by the DoD Joint Capabilities Integration and Development System, or JCIDS, were employed as guidelines in developing the military use capabilities. [8]

4.1 Commercial Capability Development Methodology and Documentation

The commercial best practices employed for defining and developing the dual-use capabilities of the GTMS included the use of Value Stream Analysis and the Supply-Chain Operations Reference-model (SCOR). The Value Stream Analysis approach employed, which is fully described in the SM21 Experimentation Plan[9], is a derivation of Value Stream Mapping pioneered by Womack & Jones of the Lean Enterprise Institute (LEI).

[8] "Operation of the Joint Capabilities Integration and Development System", Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01F, DoD, 1 March 2009.
[9] Dr. Larry Mallon, California State University, Long Beach Foundation, Baseline *Joint Experimentation Campaign Plan*, Prepared for the Office of Naval Research, June 19, 2008, pp. 37-40.

SCOR is a process reference model endorsed by the Supply-Chain Council (SCC) as the standard diagnostic tool for supply chain management. SCOR describes the business activities associated with all phases of satisfying a customer's demand. The model is based on three (3) major areas: process modeling, performance measurements, and best practices. While the overall SCOR model includes five distinct management processes: Plan, Source, Make, Deliver, and Return, the SM21 Research Federation focused on the Deliver processes; specifically, services related to order management, transportation management, and distribution management.

4.2 Military Capability Development and Documentation

As previously noted, JCIDS is the formal DoD system established to develop acquisition requirements for future defense programs. SM21 employed the JCIDS process to specifically address deployment and distribution capability gaps and shortfalls. The JCIDS process also supported the SM21 analysis in deciding whether a solution to a potential operational gap required the development of a physical system (a materiel solution) or a procedural or training based solution (a non-materiel solution).

SM21 referred to the Joint Logistics (Distribution) Joint Integrating Concept [JL (D) JIC], Version 1.0, February 7, 2006 to guide the development of the JDDSP experimentation program. The JL (D) JIC complements the ideas expressed in the Focused Logistics Joint Functional Concept. In particular, two challenge areas from the Joint Functional Concept, the over-arching functional concept, are specifically addressed in the JL (D) JIC – joint deployment/rapid distribution and agile sustainment. These two areas cover the intended scope of the SM21 JDDSP support concept for military operations.

The Joint Integrating Concept (JIC) provided a conceptual foundation for future capability development activities and identified areas where the SM21 Business Federation can provide support to joint distribution operations. The concept paper contained sufficient detail to allow the SM21 Research Federation to establish an experimentation program. More specifically, the JIC calls for a joint deployment and distribution enterprise (JDDE), which the JDDSP can directly support. The JDDE concept was developed to provide joint force commanders (JFCs) with the ability to rapidly and effectively move and sustain joint forces in support of the full range of military operations (ROMO). While the JDDE will complement, interact with and augment Service or JFC-unique distribution responsibilities and capabilities, the JDDSP was designed to fill in the JDDE capability gaps.

The SM21 Research Federation JCIDS analysis produced two primary documents: the SM21 Concept of Operations - Joint Deployment and Distribution Support Platform (JDDSP): Joint Operational Concept (JOC) and the Initial Capabilities Document (ICD). Together, the documents defined the required JDDSP capabilities and guided the system development and experimentation program. Both the JDDSP JOC and the ICD, along with the supporting Capability Assessment Reports, the SM21 Research Federation Final Report, and this Transition Report will be used to guide and focus the transition process.

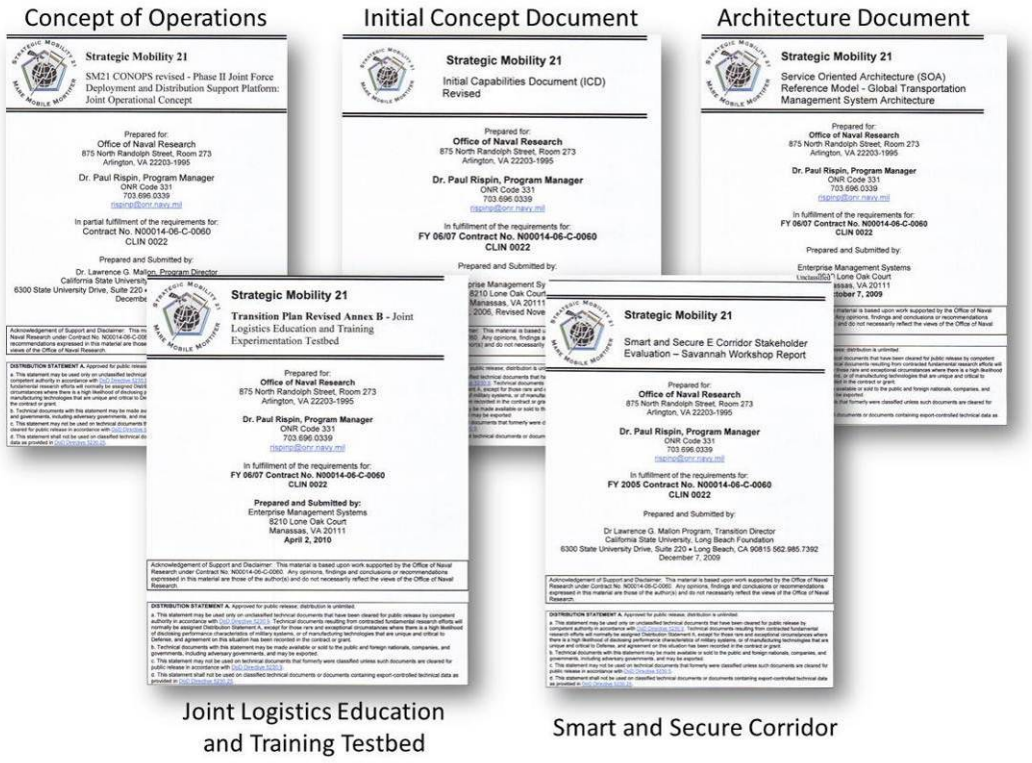

Figure 13 – Strategic Mobility JDDSP Key Documentation

4.3 Joint Deployment and Distribution Support Platform - Joint Operational Concept

The purpose of the Joint Operational Concept (JOC) is to define the Joint Deployment Distribution Support Platform (JDDSP) concept of operations. The JOC is the foundational document guiding the vision of the JDDSP. The JDDSP is an operational level concept that merges adaptive planning, execution, and integration of both commercial freight operations and the deployment and sustainment of joint military forces within a single construct. As a single node, the JDDSP was conceptualized to seamlessly integrate with and support the end-to-end distribution process network.

4.4 JDDSP - Initial Capabilities Document

The initial capabilities for the dual-use Joint Distribution and Deployment Support Platform designed by the SM21 Research Federation program are defined in the ICD. [10] The transitioning JDDSP military Initial Operating Capability (IOC) will support military force deployment from the Continental United States (CONUS) source through the strategic port to the final ship stow location. The commercial IOC will support the processes associated with transportation support to the supply chain logistics "deliver" function. The JDDSP Full Operating Capability (FOC) represents a system-of-systems that includes both physical infrastructures and information management systems.

[10] Dual use is a cooperative/collaborative commercial and military use of the terminal facilities.

The JDDSP was developed to better integrate military and commercial execution level systems in order to enable more control over the flow of force deployments and sustainment distribution. The objective is to provide responsive support to the Combatant Commander during Expeditionary Theater Opening (ETO) operations across the full Range of Military Operations (ROMO) and to continue sustainment support operations until the conclusion of hostilities or disaster relief operations. To accomplish this goal, the JDDSP has been designed as a CONUS regional node within the DOD Joint Deployment and Distribution Enterprise (JDDE). The JDDE is designed to manage and regulate force deployment and sustainment distribution flow as articulated in the Joint Logistics (Distribution) Joint Integrating Concept. The JDDSP could also support the JDDE outside of CONUS at Advance and Intermediate Staging Bases.

The development of the GTMS, which was designed to support JDDSP clients with dual-use supply chain logistics "deliver" function support, provided significant insight into the full potential of the JDDSP. The GTMS was developed by the SM21 Research Federation, in collaboration with Dole Packaged Foods, to fulfill the dual-use distribution requirements of the JDDSP.[11] The GTMS is based on a Service Oriented Architecture (SOA) using open source software components. The SOA integrates selected best-of-breed commercial software systems and the adaptation of Dole systems. For military IOC, the SOA will adapt military execution level systems. Additional web services will be procured or developed for integration as required by the individual military and commercial customers supported in the future.

5.0 The Transition Planning Process

The SM21 Research Federation transition planning process was formally initiated during January 2008. The transition process began with a technology readiness assessment of the dual-use capabilities, products and services developed by the SM21 program.[12] The initial planning included a general overview of several commercial and military transition dimensions, including funding sources and business planning. Appendix D – Technology Readiness Levels (TRL)[13] contains a description of the nine graded stages of technology maturity. The TRL definitions were used by the SM21 Research Federation during the technology readiness assessment.

The transition planning process occurred on two levels: strategic planning in the form of the current SM21 Research Federation's transformation to the SM21 Inc. Business Enterprise; and the initiation of basic business planning for each of several future potential spinoff entities. The transformation planning included discussions on the creation of the SM21 Inc. organization documents establishing the governance framework and defining the relationships with vendors, stakeholders, strategic partners, investors, and subscribers. While final SM21 Business Enterprise documentation

[11] Dole Packaged Foods is a division within the Dole Foods Company.
[12] Dual-use refers to the military and commercial utility of the product or service
[13] The Technology Readiness Levels were originated by the National Aeronautics and Space Administration and adapted by the DOD for use in its acquisition system.

remains to be completed post transition, documentation related to intellectual property protection was established.

This Transition Technical Report with Appendix A - Transition Workshops - summarizes the transition planning completed to date and sets forth the top level strategy to guide the transition from the SM21 Research Federation to the SM21 Inc. Business Enterprise. A focus of this document is the near term transition of technology developed by the SM21 Research Federation. It includes input from every other SM21 program task and associated task technical reports including the SM21 Research Federation's final report.

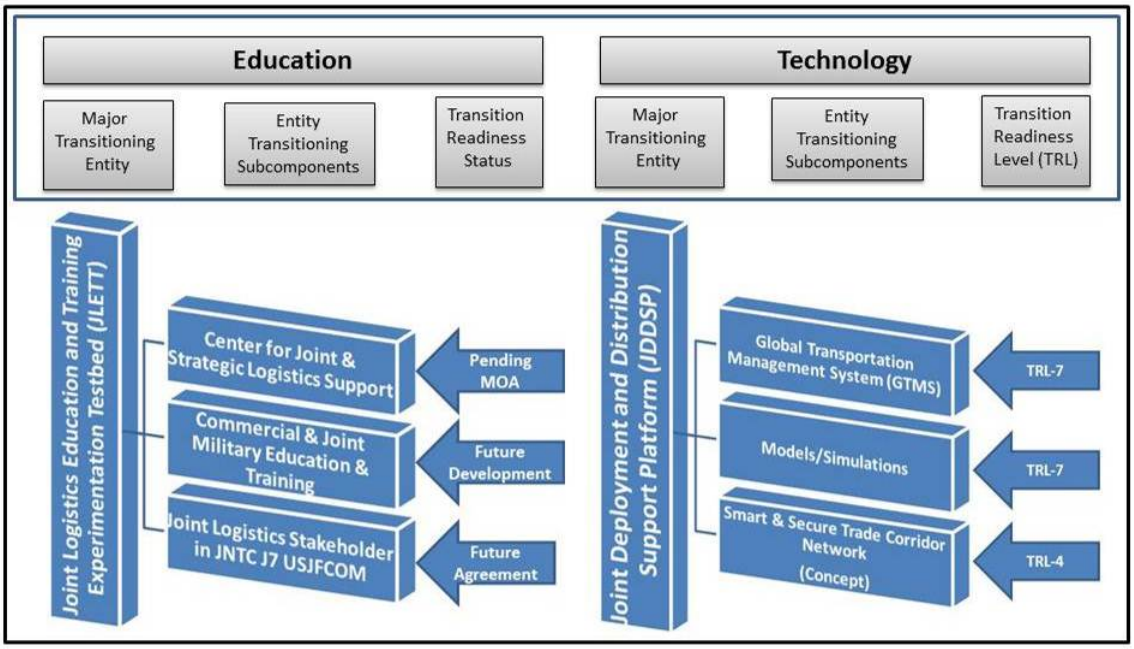

Figure 14 – Major Transitioning Program Elements and Readiness Status

6.0 The Macro Level Transition Strategy

The Transition Workshops described in Appendix A along with the Independent Technology Review, and the Capability Based Assessment, enabled the identification of the appropriate "macro-level capabilities" for transition. The identified major transition capabilities are the JDDSP and the JLETT (Refer to Figure 14 – Major Transitioning Program Elements and Readiness Status). The JDDSP and JLETT are interrelated suites of capabilities and will be the cornerstones of the SM 21 Inc. Business Enterprise. Together the JDDSP and JLETT define the parameters of the emerging Fourth Party Logistics provider business model that the SM21 Inc. Business Federation will establish in the future.

6.1 Technology Transfer Process

The technology transfer process established by the SM21 Research Federation used the JCIDS process as a general reference model. SM21 also used the NASA developed technology readiness levels (Appendix D – Technology Readiness Levels) as the basis

for tender of technology transfer agreements utilized by the Office of Naval Research (ONR).

6.2 The Joint Deployment and Distribution Support Platform (JDDSP)

The SM21 Research Federation JCIDS process began with the development of the JDDSP Concept of Operations (CONOPS). The JDDSP CONOPS is reflective of the JDDE joint guidance, which was augmented by input from both commercial distribution management professionals and military logisticians. This input included contributors to the development of the Operation Plan for Operation Iraqi Freedom (OIF) and studies from a variety of sources for joint logistics lessons learned after actions reports. The JDDSP Initial Capabilities Document was reviewed by both the US Joint Forces Command (USJFCOM) J7 and US Transportation Command (USTRANSCOM) J3 and J 4/5.

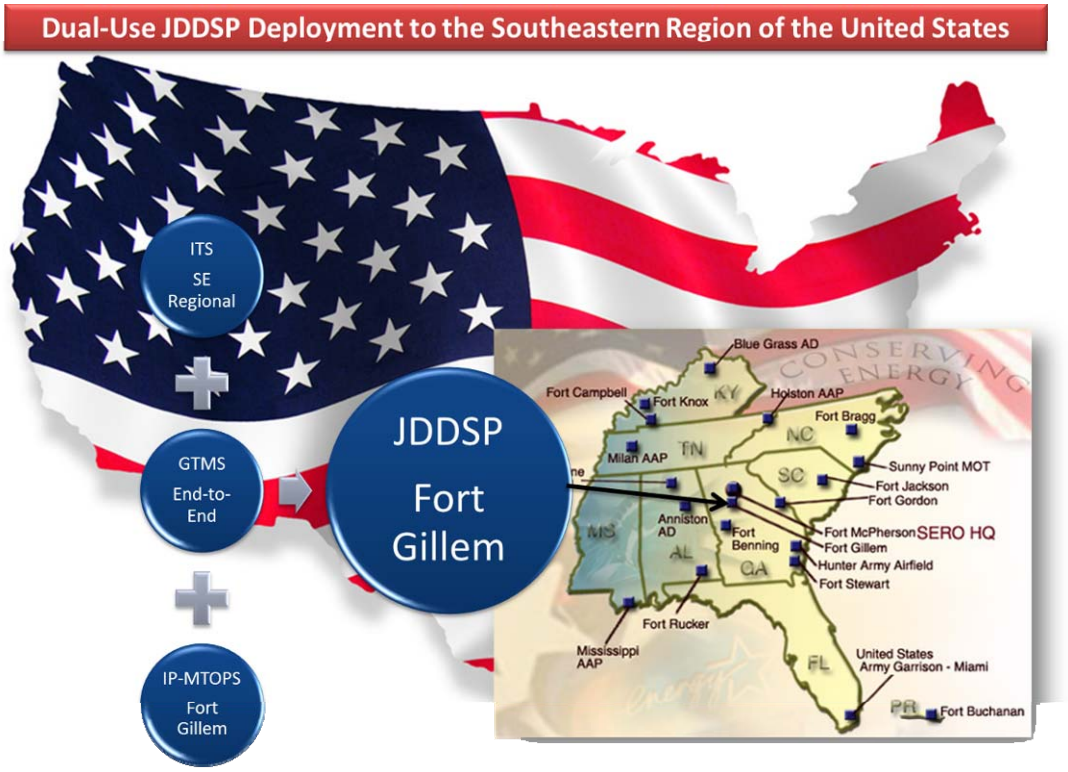

Figure 15 – Potential Fort Gillem JDDSP Dual-Use Capability

Figure 15 – Potential Fort Gillem JDDSP Dual-Use Capability - provides a high-level depiction of the potential first deployment site for a SM21 Inc. JDDSP. The Fort Gillem Local Redevelopment Authority (LRA) has discussed the potential deployment of a JDDSP capability at Fort Gillem. As depicted in Figure 15, the Fort Gillem JDDSP would include a regional Intelligent Tracking System, the In-land Port Terminal Operating System, and support from the Global Transportation Management System. The Fort Gillem location is the most likely first location for the complete build out and testing of the JDDSP design concept.

6.3 The Joint Logistics Education Training Transformation (Test-bed) (JLETT)

The second selected major SM21 transition element is the Joint Logistics Education Training Transformation (Test-bed) (JLETT), which was initiated through congressional direction in the FY 2008 Department of Defense regular appropriations law. The appropriations Conference Report Language establishing the JLETT follows:

> *"This program will formally standup a Joint Logistics Experimentation, Education and Training Test-bed (JLETT) as an innovation cell within the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (AUSDATL), the Department of Defense Executive Agent for Focused Logistics Capability Portfolio Management, as a principal component of a permanent logistics transformation strategy developed collaboratively with a Congressionally mandated Joint Logistics Technology Demonstration entitled Strategic Mobility 21 as a perquisite to incorporation in the FY 09-10 Program Operating Memorandum (POM)"*

The JLETT contract was established with the USJFCOM J7 as executive agent for the Under Secretary of Defense (Acquisition, Technology & Logistics) (USD) (AT&L). The effort resulted in three products and initiatives as outlined below:

1. A Sense and Respond Logistics Technology Roadmap
2. The Joint Logistics Education Training Transformation (JLETT) (Combatant Commander Joint Logistics Education, Training and Exercise Study) prepared for J7 USJFCOM and
3. An enhanced JDDSP regional concept designed through analysis of the 3rd Infantry Division deployment requirements from Fort Stewart, Georgia through the strategic seaport of Savannah. This included research related to the potential integration of a JDDSP multi-modal terminal located on Fort Gillem, Georgia.

6.4 Alignment of Transition Vectors with the Business Enterprise

The transition of the SM21 Research Federation to the SM21 Inc. Business Enterprise [14] is overviewed in Figure 16 – Alignment of Transition Vectors with Proposed Business Entities. The key near and long term Business Enterprise transition vectors include:

- Level Six Logistics LLC management of the GTMS JCTD execution and future pathway to one or more DoD Program Executive Offices (PEO's). The JCTD would be based on one or more militarily relevant environments, such as support to reset and retrograde cargo returning from the operational theaters and/or a no notice complex humanitarian disaster response scenario[15]. This would be similar to the scenario employed by the US Army G4 to secure Joint Requirements Oversight Council (JROC) approval of the Expeditionary Theater Opening (ETO) program;
- Semantically enabling the GTMS by SM 21 Inc. (non-profit). Continued GTMS development would be eligible for government and private foundation grants;

[14] The Strategic Mobility 21 Incorporated if formed as a 501(c) (3) nonprofit public charity

[15] The Department of Defense uses the term Humanitarian Assistance/Disaster Relief (HA/DR) to refer to responses to complex humanitarian disasters.

- Commercial and military deployment of the GTMS through Level Six Logistics, including business development associated with both advertised government procurement opportunities and non-advertised government and commercial opportunities. The intention is to package Level Six Logistics for a private placement after several years as an expansion/exit strategy;
- Establish LogisNet as a data warehouse reseller; and
- Establish the JLETT as a Joint military education and training support capability. The first step is the development of a memorandum of agreement (MOA) with the Center for Joint and Strategic Logistics (CJSL) and potentially both the Joint Staff J4 and the US Joint Forces Command (USJFCOM) – Joint National Training Center J7

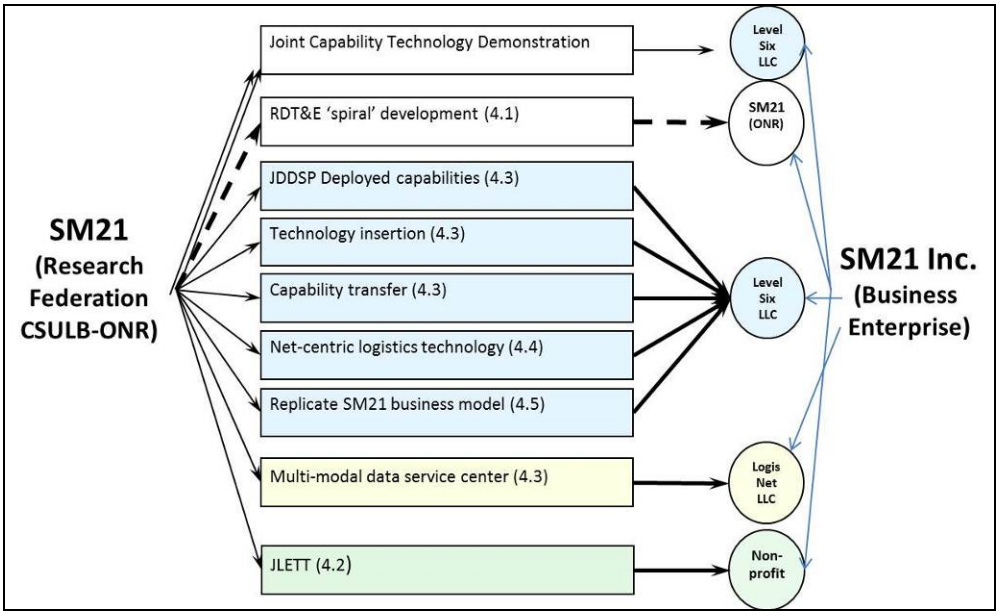

Figure 16 – Alignment of Transition Vectors with Proposed Business Entities

Figure 17 – Transition Strategy - reveals the program roadmap that evolved through: program guidance; SWOT analysis; emerging opportunities; market feedback and response; forecasting, and intuition. Figure 16 – Alignment of Transition Vectors with Proposed Business Entities and Figure 17 – Transition Strategy provide a good overview of the transition roadmap for both the technology and managing business organizations.

Among the potential SM21 Inc. technology and service customers and partners are:

- Government and commercial shippers,
- Transportation Agencies,
- 3rd Party Logistics Companies and Logistics Service Providers, and
- Local Redevelopment Authorities (LRA)

The GTMS technology and services that are "marked" for transition were identified by how well shippers resonated with specific aspects of the technology, starting with Dole Foods and their supply chain network partners. The technology and services receiving the best shipper responses were:

- Single sign on track and trace capabilities,
- Re-prioritization of container pickups at seaports of entry
- Customer driven exceptions management
- Contract management
- Integrating CONUS and OCONUS freight movement
- Trade compliance
- Adaptive planning (especially with the military)
- Business process reengineering
- Load consolidation and distribution channel management
- Make, buy, source, and deliver function's decision support. Note: while the make, buy, and source functions were emphasized by stakeholders as much as or more than the deliver only function, the SM21 Research Federation only developed the deliver function support capabilities as the JDDSP initial operating capability
- Regional network modeling and simulation and optimization for regional transportation planning agencies, local redevelopment authorities, and with 3PL's, and
- Value stream mapping

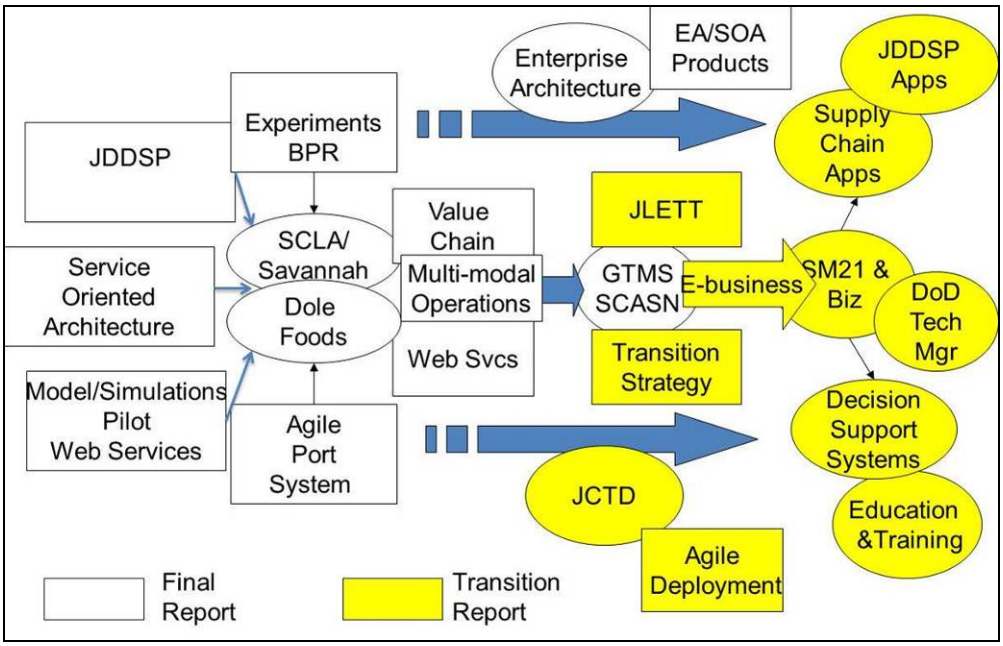

Figure 17 – Transition Strategy

7.0 Primary Execution Level Technology Transition Vectors

The transition process, outlined in Figure 16 and Figure 17, was based upon extensive feedback from both internal analysis and external stakeholders. The technology identified for potential transition into near term military and commercial use is considered the initial operating capability (IOC) of the JDDSP design concept. The near term technology transition is focused on the GTMS deployment, as configured for use by Dole Packaged Foods, and the supporting modeling and simulation programs.

The primary near term technology transition vectors are outlined below:

- Dole Foods commercial deployment of the GTMS;
- Planning for a Joint Capability Technology Demonstration (JCTD) to expose the Dole user acceptance tested GTMS and supporting transactional business model across the DoD enterprise; additionally,
    - Employ modeling, simulation, and business process modeling tools;
    - Include additional technology developed by CSULB Foundation and funded by ONR[16]; and,
    - Complete the military use assessment begun with the 3rd Infantry Division under the Agile Port System program;
- Integration of OCONUS and CONUS "best source" shipment data, either under the proposed JCTD or through separate commercial contract modification to the

[16] Includes California State University, Long Beach Foundation (CSULB Foundation) supported technology and concepts developed through both Strategic Mobility 21 and the Center for the Commercial Deployment of Transportation Technologies CCDoTT

Defense Transportation Coordination Initiative (DTCI). The objective is to provide integrated shipment track and trace capabilities while enabling nodal optimization across DoD deployment and distribution channels;

- Creating regional public-private partnerships centered on the JDDSP transportation and distribution hubs.

The overarching JDDSP concept, as defined in this report, is the principal legacy of the SM 21 Research Federation. The JDDSP is the logical dual (military and commercial) inland multi-modal transfer facility designed as an extension of the original Agile Port System (APS) concept. The JDDSP links an "agile" marine terminal with the inland multi-modal facility either physically via a dedicated corridor, or virtually via a regional web network. The SM21 Research Federation further defined a smart and secure trade corridor as: "an actively monitored, technology verified, Customs-Trade Partnership against Terrorism (C-TPAT) Level 3 trade lane for all participating (on-boarded) shippers." Regional JDDSP's linked by "intelligent" road, rail, and air links comprises an agile supply network (ASN).

7.1 The Commercial GTMS Technology Transition Process and Timeline

The deployment of the GTMS by Dole Packaged Foods is the first planned program commercial technology transfer. An overview of the GTMS Dole foods functionality is provided in this report. The SM21 GTMS Architecture Document[17] contains a more complete description of the GTMS technology. The GTMS was designed in collaboration with Dole Packaged Foods to ensure commercial best practices were incorporated in the system architecture.

Deploying a commercially viable system using the software as a service (SaaS) business model provides two primary advantages to DoD. First, a commercially viable SaaS GTMS will reduce government deployment and operating costs; second, it will ensure the system continues to employ the best technology available at the lowest possible lifecycle cost.

The GTMS has completed two spirals of development and has successfully passed two User Acceptance Test (UAT) periods with Dole Foods. After the completion of the second UAT, the GTMS was provided to Dole Foods for a 30 day extended user testing period or trial period, which ended on November 30, 2010. The second UAT and extended user trial period enabled the identification of both the functionality enhancements required before the system deployment and also the enhancements that can be scheduled for phased completion after the system is deployed.

The Dole Foods GTMS integration could be initiated during mid-2011 pending the final deployment of the SAP enterprise resource planning system by Dole. The major planning and development events leading to the potential Dole GTMS deployment by

[17] Enterprise Management Systems, *Strategic Mobility 21 Service Oriented Architecture (SOA) Reference Model – Global Transportation Management System, Prepared for the Office of Naval Research, October 7, 2009*

Level Six Logistics are provided in Figure 18 – GTMS Commercial Deployment Timeline.

7.2 The GTMS Military Transition Project Planning and Timeline

The GTMS military transition is being pursued through the development of a Joint Capability Transition Demonstration. The JCTD proposal development effort was originally designed to initiate the transition of the dual-use Agile Port System (APS) established by CCDoTT and supported by Strategic Mobility 21 through integration with the Joint Deployment and Distribution Support Platform (JDDSP). The combined APS-JDDSP JCTD was designed to solve known capability gaps in Joint force deployment operations and to relieve strategic port congestion during major contingency operations. However, after the issuance of DoD guidance restricting the JCTD to a two year versus the prior three year JCTD efforts, this approach was determined to be too board. The additional requirement issued to complete a major capability demonstration within the first year of a JCTD being awarded further complicated the original strategy. As a result of the new JCTD program guidance and the results of the SM21 transition planning process, it was determined that the best approach for a JCTD was to focus on the configuration and demonstration of the Dole Foods configured GTMS. The GTMS is considered to be at Technology Readiness Level – 7 since it has completed extensive commercial user acceptance testing by Dole Packaged Foods.

The proposed JCTD is designed to employ the GTMS for both DoD Joint Logistics and Interagency Operational Support of a Humanitarian Assistance/Disaster Relief (HA/DR) response operation within a sea based logistics environment. The JCTD is being proposed as a two year program with a third year option.

Dr. Paul Rispin, ONR Code 333, the current SM21 ONR Project Manager, is the official JCTD proposer. The summarized JCTD proposed technology description follows:

> *"Web-based services that facilitate the "deliver" function of supply chain logistics. Technologies focus on transportation at the "execution level" to support commander's intent. GTMS employs a Service Oriented Architecture using advanced, open source, semantic web components intended to provide rapid and inexpensive integration of disparate data from both military and commercial sources. Advanced modeling and simulation tools integrated with the GTMS enable continuous tracking of "exceptions" (planned vs. actual performance), a top priority for both military and commercial logisticians. GTMS will also provide web services for commercial / military lift nomination and Drayage Management. GTMS is now undergoing the second spiral of "user acceptance testing" at Dole Packaged Foods. Dole Foods International is the world's largest provider of fresh fruits and vegetables, a Fortune 100 company and a JCTD partner."*

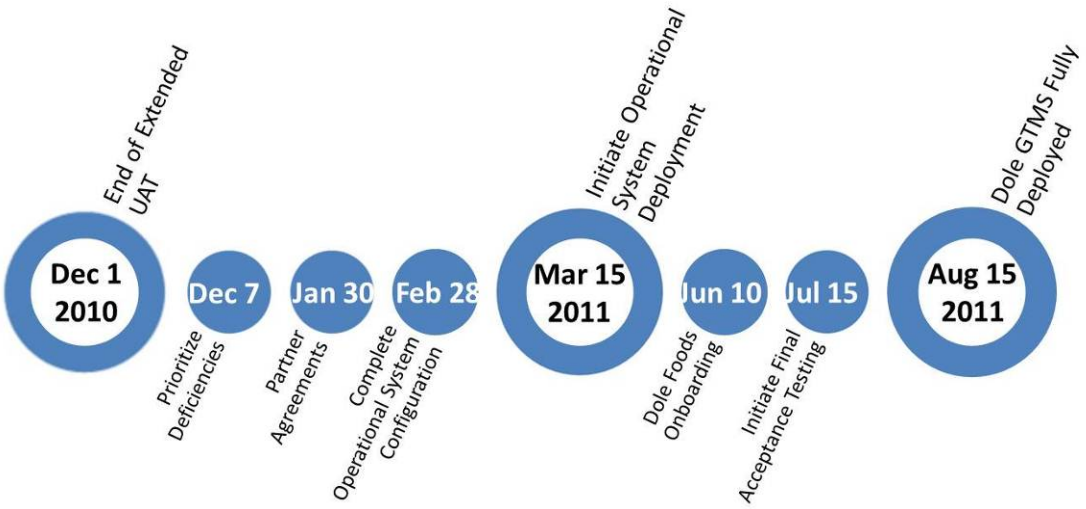

Figure 18 – GTMS Commercial Deployment Timeline

The proposed GTMS JCTD Products (deliverables) include:

- Year 1 - Global Transportation Management System (GTMS): Best-of-Breed Information Management Technologies delivered as a Web-Service
- Year 2 - Drayage Management System: Web-service as part of GTMS
- Year 3 (Option Year) - Strategic Lift Nomination Web Service: Integration of Transportation Exploitation Tool (TET) and Transportation Internet Portal (TIP) to provide End-to-End Lift Nomination Capability.

The SM21 Inc. GTMS JCTD validated need is composed of the following:

- Strategic Mobility – 21, Initial Capabilities Document (ICD), 19 November, 2009
- Joint DOTMLPF Change Recommendation for Expeditionary Theater Opening, 10 February 2008
- TET Endorsements from: USTRANSCOM, Navy Supply Information Systems Activity, US Fleet Forces Command and COMPACFLT
- Program Aligns with 9 of 11 gaps identified in USTRANSCOM, Joint Deployment and Distribution Enterprise, http://www.transcom.mil/rdte/

The technology maturity levels of each component of the proposed JCTD anticipated at the time of the JCTD initiation in Fiscal Year 2012 are:

- GTMS SOA: TRL-7
- Semantic Web Tools: TRL-7
- GTMS Transportation Internet Portal: TRL7
- Transportation Exploitation Tool: TRL-6
- Modeling, Simulation and Analysis: TRL-7
- Drayage Management System: TRL-6

The proposed JCTD Concept of Operations for demonstrating the GTMS capabilities could be employed in two domains:

- Domain 1: PACOM as Operational Manager with GTMS Capabilities focused on Humanitarian Assistance/Disaster Relief support through a sea based logistics environment
    - GTMS Web Services would be integrated and hosted on All Partners Area Network (APAN)
    - Demonstrations run against PACOM HA/DR Scenarios. Potential collaboration with the PACOM Center for Excellence in Disaster Management and Humanitarian Assistance
    - GTMS Web Services Operated and Maintained by Level Six Logistics
    - Possible Participation by the Defense Logistics Agency (DLA) and the United States Marine Corps Logistics Command (USMC LOGCOM)
- Domain 2: USTRANSCOM as Operational Manager with GTMS Web Services being implemented by Surface Deployment and Distribution Command (USTRANSCOM Component Commander)
    - Expanded Defense Transportation Coordination Initiative (DTCI) managed by Menlo Worldwide Logistics (3PL)
    - Demonstration to assess impact of GTMS on Reset and Retrograde shipments entering the US through the Ports of Charleston and Houston.
    - GTMS Operated and Maintained by Level Six Logistics
    - Reset and Retrograde of interest to DLA Army G4, and USMC LOGCOM

The submitted JCTD proposal included three demonstrations in three successive years with a leave-behind after each demonstration. The third proposed demonstration is in the Option Year. The demonstrations are outlined below:

- Year One: Reset and Retrograde. Leave Behind: GTMS Web Service to the SDDC/DTCI Program Manager
- Year Two: Humanitarian Assistance / Disaster Relief. The leave behind from this demonstration would be the GTMS configured for HA/DR response missions and provided through the APAN portal as web services.
- Year Three (the option year): The Lift Nomination Web Service.

The initial JCTD Cost and expected Funding Plans have been developed and were submitted as an initial estimate as a part of the Navy JCTD proposal. While the Cost Plan is a reasonable estimate, the JCTD Funding Plan is incomplete since the program stakeholders and sponsors have not yet been confirmed.

The JCTD GTMS Development, Demonstration, and Transition Timeline is provide in Figure 19 – GTMS JCTD Integrated Schedule

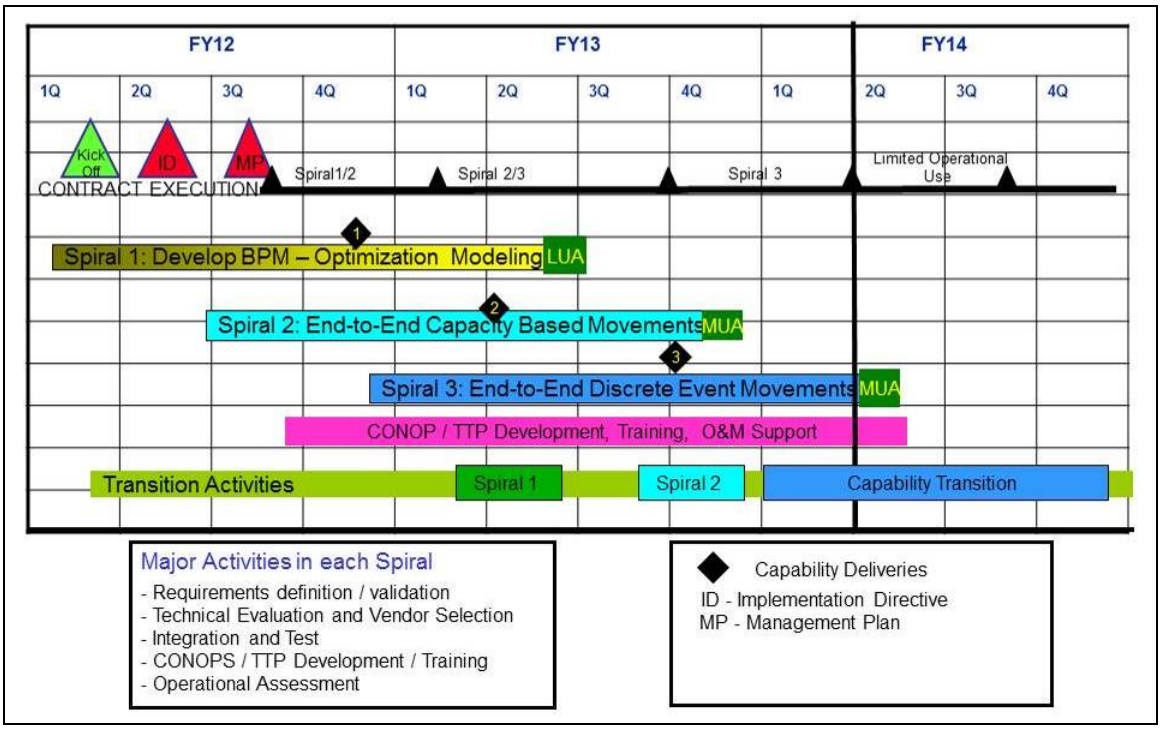

Figure 19 – GTMS JCTD Integrated Schedule

8.0 The 4th Party Logistics Provider Pathway

The preceding analyses and discussions are important to the transition process; however, timely decisions concerning the actual transfer of authority and responsibility to plan and execute the post CSULB Foundation - ONR program is critical. The continuing transition reflected in the executed CSULB - SM 21 Inc. technology transfer agreement, and the prosecution of this transition plan and strategy through the selection of the operational, organizational and legal models for the follow-on SM 21 Inc. Business Enterprise is still unfolding. As previously noted, the transition begins with formal standup and assumption of the transition planning functions by the SM 21 Inc., formed as a 501(c) (3) nonprofit public charity.

The program technology and concept ownership transfer is overviewed in Figure 20 – SM 21 Technology Transfer , which depicts the transition from the ONR supported CSULB Foundation managed SM21 Research Federation to the newly formed SM21 Inc., 501C (3).

Over the relatively short life of the SM 21 Research Federation, three “brands” resonated within the larger joint logistics community of interest and practice. These were:

1. The program name Strategic Mobility 21, which has gained significant recognition as exemplified in GA Senate Resolution 295;
2. The Southeast Agile Supply Network (SEASN©) simulation model that is well known by public and private stakeholders in the States of Georgia and Florida; and

3. JLETT beginning with its endorsement in the FY 2008 DoD appropriations measure and continuing with its association with the Joint Logistics Education and Training Roadmap and Knowledge Management repository collaborative effort with the NDU CJSL.

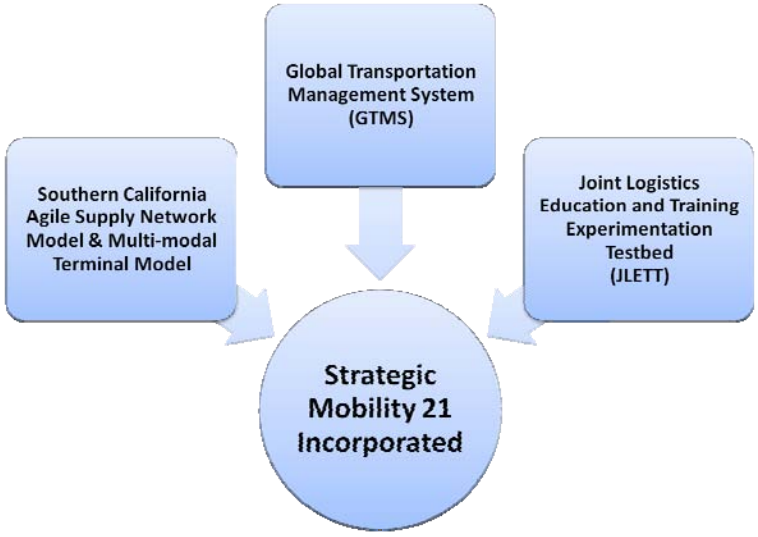

Figure 20 – SM 21 Technology Transfer Agreements

Establishing SM 21 Inc. as the transitioning Business Enterprise met several articulated transition objectives:

(a) It mirrored the CSULB Foundation 501(c) (3) as a single logical repository with both a demonstrated outreach (and now reach-back) to the faculty. The SM21 Inc. Founder has an over ten year relationship with the CSULB Foundation. The SM21 Inc. Founder acting as the Transition Director developed, with the CSULB Foundation, a coherent long term vision for the utilization, dissemination, and diffusion of the documented intellectual property emanating from the SM 21 Research Federation;
(b) It projected both positive name recognition and program continuity with many stakeholders and sectors; and
(c) It exemplified the social enterprise core values of the SM 21 Research Federation program and attracted other potential third party logistics providers, supporters and strategic academic, government and industry partners inspired by the vision, mission, transition plan and long term strategy, and potential of the program.

The legal model of SM21 Inc. as a 501(c) (3) was both a logical and popular choice within the emerging community of interest and practice for the SM 21 program as an emergent logistics transformation movement. Other affiliate 3PLs are to be formed or associated as necessary business entities in compliance with Federal tax law and to preserve the core values of the enterprise. Level Six Logistics LLC was established as the first affiliate 3PL. The name was selected to capitalize on the military parlance for

visibility down to the SKU or item level. LogisNet will be formed to provide predictive supply chain analysis utilizing aggregated logistics data.

The near term GTMS Transition to Dole will be managed by Level Six Logistics. Other affiliate 3PLs will be selected from the ranks of authoritative source and trusted agents disproportionately represented in the population of Service Disabled Veteran Owned Small Businesses (SDVSOB) and other privately held minority and women owned small businesses. At the same time, SM 21 Inc. will partner with large defense and commercial businesses and nonprofit research entities with compatible values, core capabilities, strategic markets, and a commitment to participation in an independent logistics research and technology development consortium. The vision is for SM 21 Inc. to create an operating environment similar to the Rand Corporation, Brookings Institution, Guggenheim Foundation, and South Carolina Research Association.

The commercial transition market channels for the constellation of entities within the SM 21Inc. Business Enterprise fall into two categories: first, advertised government and commercial opportunities as a preferred small business vendor and, second, unadvertised opportunities built around evolving strategic partnerships and alliances.

In order to attain self-sustaining status, the evolving SM 21 Business Enterprise model will require at least one of the business affiliates to grow a sufficient "book of business" to enable an exit strategy and the resultant source of expansion financing. The objective is to execute the exit strategy in a relatively short period of time (as measured in years) to be acquired via private placement.

8.1 The Fourth Party Logistics Service/Solutions Provider Operational Model

In terms of the logistics domain, the evolved end state of SM 21 Inc. Business Enterprise organizational structure is the Fourth Party Logistics Service/Solutions Provider (4PL) operational model. Figure 21 – SM21 Business Enterprise Operational 4PL Model, depicts the value and central role of a 4PL acting as the single interface between a client and multiple 3rd Party Logistics (3PL) providers. The 3PLs can perform a variety of services including data provisioning, information management solutions, or physical services as examples. A 4PL designs, builds, manages, or makes recommendations based upon real-time enterprise-wide monitoring and predictive analytics or sense and respond performance based logistics at the execution level.

Finally, SM 21 Inc. as a 4PL and Value added Network integrator:

- Protects intellectual property and licenses technology to 3PL providers and Value Added Resellers
- Productizes current and future capabilities and develops its own algorithms and intellectual property

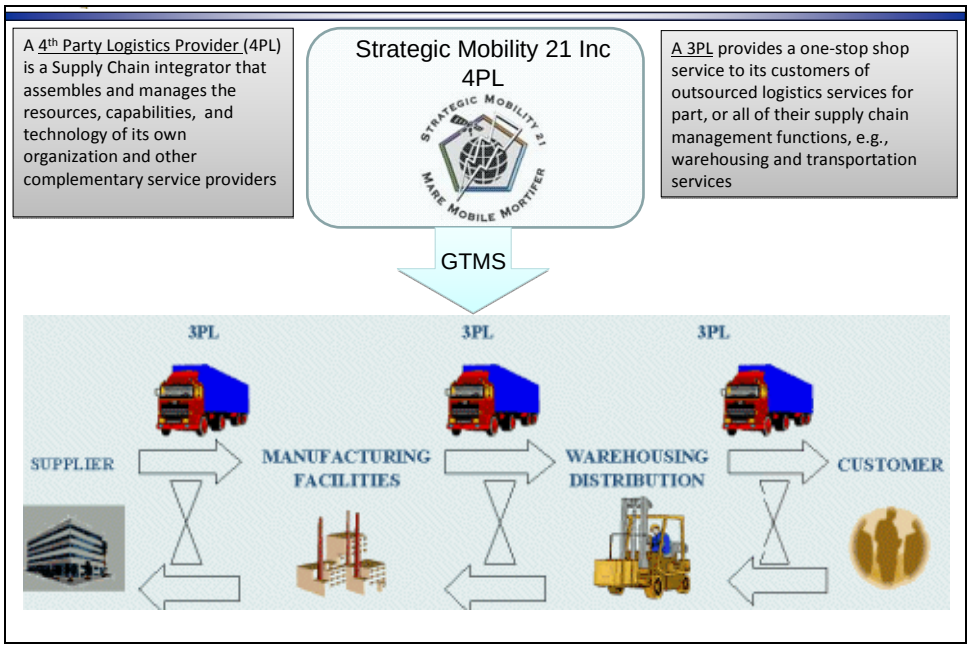

Figure 21 – SM21 Business Enterprise Operational 4PL Model

9.0 Lessons Learned for Consideration during the Transition

The SM 21 Research Federation's transition to a self-sustaining SM21 Inc. Business Enterprise yielded a veritable harvest of observations and recommendations. Outlined below are a few of the more significant ones:

- Near real-time visibility supply chain deliver functions is transformational.
- Use a red team to validate hypotheses, experiments, and use cases.
- Define real, not perceived problems. Customers may initially provide limited insight into the real operational issue when asking for system changes. The real problem, in terms of the end-to-end deliver function network, may require a different solution.
- Model/simulate to obtain the 80% solution first, then prototype, demo, and finally deploy.
- Best of breed agile development works but must be documented (record scrum sprint sessions and maintain within a web based project management information system).
- Balance open source with commercial software and tradeoff speed to market with maintenance and scalability.
- Visualization makes data/context/knowledge management transformational. Design multiple consumer/stakeholder focused dashboards to make system more user friendly. Look beyond visualization to experiential.

- Analyze business process (As-Is) and develop service requirements first, then establish to-be business process model, and then create SaaS web services. Finally, map KPI metrics to services (performance and effectiveness).
- Enable stakeholder collaboration, which will ultimately guide/support use case and business case development for resources and market penetration.
- Design deliver function support services with maximum visibility, security, and scalability to lower the cost of extending services to all freight moving in a trade corridor. Develop the ability to provide load consolidation to drive lane density in smart corridors.
- The positive impact of providing increased visibility and improved near real-time deliver function business intelligence is that it provides stakeholders with: better predictive analysis enabling lower development, manufacturing and transportation costs; enables quality assurance improvements; and, finally, increased revenue.
- Establish individual mental models to document vision and use reference models to assist design. Then always validate requirements (relevance) with users at both the enterprise and execution levels. Finally, set and enforce standards for data providers.
- Design knowledge management systems to capture/store/retrieve/reuse data employing semantic architectures.

Additional lessons learned are available in the Strategic Mobility 21 Global Transportation Management System Experimentation: Lessons Learned Report dated November 5, 2009 with the final update dated December 21, 2010.

10.0 Conclusion

This report provides a roadmap for the SM21 program transition from a Research Federation to a Business Enterprise. The SM21 Research Federation over the last six years developed the two major concepts planned for dual-use transition: the Joint Deployment and Distribution Support Platform and the Joint Logistics Education Training Transformation (Test-bed). As described in this report, beginning at the end of December 2010, the JDDSP management will be transitioned to SM21 Inc. operating as a not-for-profit entity. Over time SM21 Inc. will evolve into a 4th Party Logistics Provider or 4PL to manage the JDDSP deployment while providing logistics education and training through the JLETT. The exact operating structure for the 4PL will need to be developed over the first year of the SM21 Business Federation's commercial operation of the GTMS. Lessons Learned provides additional points to be considered during and after the completion of the transition process.

The initial operating capability of the JDDSP, which is planned for commercial deployment to Dole Packaged Foods, is the Global Transportation Management System (GTMS). The deployment of the GTMS to the military operating environment is being planned through a Joint Capability Technology Demonstration (JCTD). While the basic JLETT concept and the JDDSP initial operating capability were completed during by the Research Federation, the continued development of the JDDSP and the JLETT will take

place after SM21 completes the transition process to a Business Enterprise.

The recognized achievements of the SM21 Research Federation to date have been significant. However, the true success of the SM21 Research Federation will be determined after the technology and processes developed during the program are fully transitioned and deployed to both the commercial and government sectors.

Appendixes A through D that follow provide additional transition support information.

Appendix A - Transition Workshops

How successful the technology transition will be is dependent on a sound business model supported by a viable business structure. To define the business model and structure for transitioning the SM21 developed technology, a series of facilitated internal transition workshops were established during planning meetings in January 2008. The workshops were conducted over an extended period from September through December, 2009. The primary purpose of the workshops was to focus the SM 21 program core team on transition and the evolution of a business model. See Figure 22 – SM21 Transition Workshops Overview.

The workshops provided a generic business formation construct adaptable to the purpose. The workshops were led by two members of the Small Business Administration (SBA) core of retired executives (SCORE) and an Orange County venture network. The outcome of the workshops was a basic business plan focused on formation of the SM21 Inc. - Business Enterprise but did not include an exit, or a capital expansion investment strategy, and they did not result in the establishment of an entity to transition the primary technology identified as ready for transition.

As SM21 began the transition process, it looked for precedence in developing its transition plan. This lead to the discovery that the Computer Aided Design Research Center (CADRC), started by the California Polytechnic (Cal Poly) State University, San Luis Obispo School of Architecture, successfully transitioned to a privately held corporation while maintaining a research component linked with the campus. Similarly, CSULB had recently spun-off a private corporation, True Point Systems, incubated in the College of Engineering (COE). The spin-off entity was based upon a patented Real Time Location System (RTLS) with university direct investment led by a successful serial entrepreneurial management team. Both business models influenced the development of the resulting hybrid SM21 Inc. social enterprise model.[18]

A review of the workshops revealed weaknesses and benefits in both the manner in which the workshop sessions were conducted and their results. Two unforeseen weaknesses in the sessions were the general level of inexperience with start-up businesses between the former DoD and SCOR small business councilors and the lack of continuity in attendees.[19]

Despite the two identified drawbacks, the Transition Workshops produced many benefits. The principal benefit of the workshops was to focus key team individuals into a transition frame of mind and to sharpen the discussion on the need for a transition roadmap. The remainder of the transition planning effort built upon this foundation however limited its initial impact.

[18] The Social Enterprise Alliance defines a “social enterprise” as “an organization or venture that advances its primary social or environmental mission using business methods.”

[19] The lack of continuity in attendees between meetings handicapped the level of discussion at key junctures.

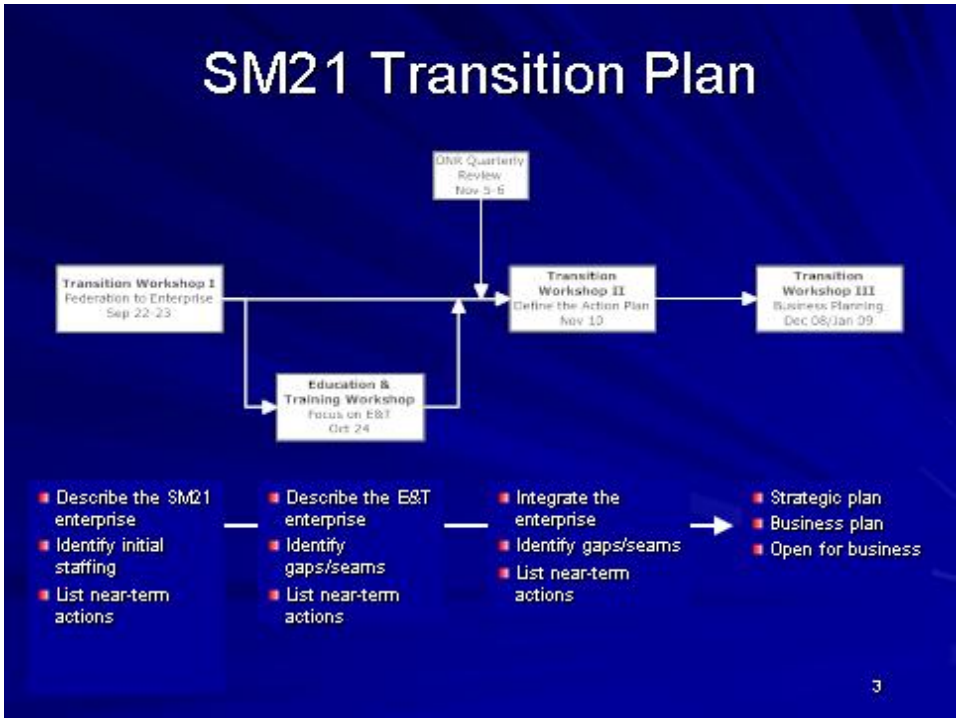

Figure 22 – SM21 Transition Workshops Overview

Transition Workshop I

The first workshop developed an initial roadmap for the transition from research enterprise to business enterprise. The workshop defined the products and services, potential customers and partners, business revenue models, resourcing, governance, staffing, and legal, organizational and operational considerations. See Figure 23 – SM21 Transition Workshop I Objectives.

In addition to the roadmap, the first workshop achieved two fundamental purposes. First it identified the natural transition elements of a for-profit entity capable of seamless service delivery associated with the Global Transportation Management System (GTMS) in the commercial and military marketplace. Second, it outlined the initial establishment of a non-profit entity to plan and execute the education and training function through the Joint Logistics Education Training Transformation (Test-bed) (JLETT). In general terms the first workshop defined the "As Is" and "To Be' transition outcomes.

The SM21 initial workshop outcomes are highlighted below:

- Evolved SM21 from Research Federation to Business Enterprise (From "As-Is" to "To-Be")
    - Evaluated the potential for transition
    - Identified entry points for Spiral Development and DoD POM Program of Record
- Assumed new enterprise includes "for profit" and "non-profit" entities
    - To separate Global Transportation Management System from Education and Training activities
    - Subsequently relaxed assumption

- Assembled the SM21 Enterprise "Pieces"
  - Depicted the enterprise's structure organization
  - Identified gaps and seams for the second workshop

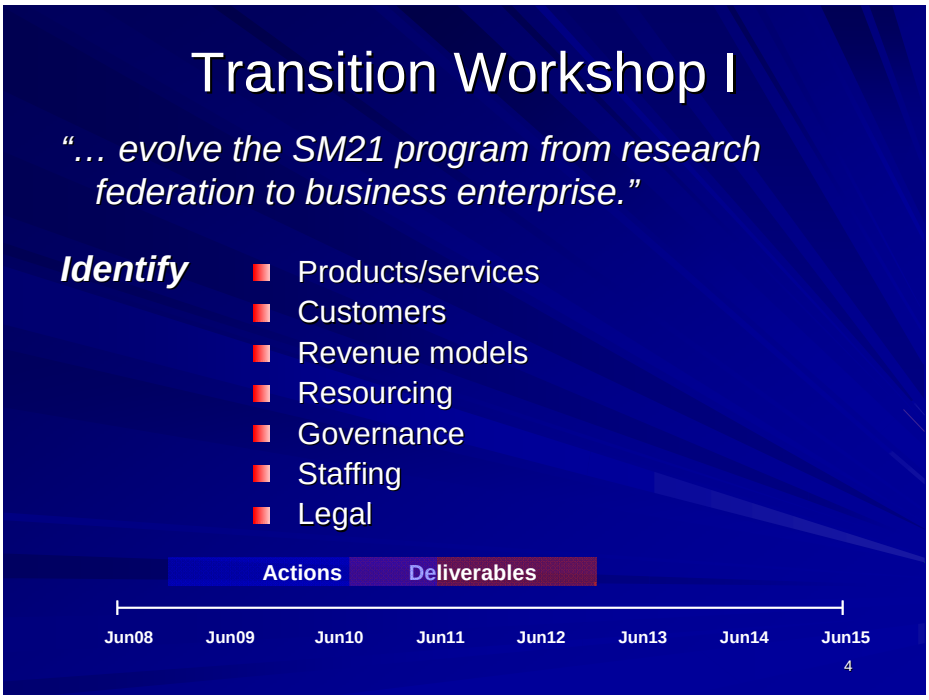

Figure 23 – SM21 Transition Workshop I

Transition Workshop II

The second workshop focused almost exclusively on the transformation of education and training and social welfare[20]. There was a wide disparity in the level of engagement and in the experience with transition among the workshop participants despite the presence of the College of Engineering (CoE) and the College of Business (CoB) faculty. Overall the workshop was disappointing in terms of progress made in defining roles and channels for logistics education and training beyond an obvious need. The transition road map was not discussed during the second workshop. However, in retrospect it would have been beneficial to review the Workshop I developed roadmap during the second workshop and to have made appropriate adjustments based on the discussion of the participants attending.

The outline for Workshop II is provided below:

- Theme: "Determine the Education and Training "go-forward" plan……
  - Define E&T and develop a road map to integrate into SM21 transition."
- Continue from Transition Workshop I

[20] The second workshop clearly benefited by the attendance of Dr Robert J Behm, former Dean of the College of Extended Education at CSULB and Marianne Veneiris, Executive Director of CITT, sponsor of the industry renowned Global Logistics Specialist Program. The College of Extended Education is now called the College of Professional Education

- Re-describe the Education and Training federation
  - Customers
  - Products/services
  - Partners/vendors
- Road map to rejoin SM21 Transition
  - Activities
  - Events
  - Resources required

Figure 24 – Education and Training Products, Services, Partners, and Customers, depicts the social network aspects of the SM 21 education and training program. The education and training aspects of the SM21 program were not strongly encouraged by the ONR contract. Nevertheless, at every SM21 Joint Deployment and Distribution Support Platform (JDDSP) venue (the Southern California Logistics Airport (SCLA) and Fort Gillem, Georgia) the Local Reuse Authorities and educational institutions strongly endorsed the formation of an education and training community of interest network and strategic alliance with the SM 21 program. The use of the program's capabilities in support of regional economic and workforce development was also strongly encouraged.

Figure 24 – Education and Training Products, Services, Partners, and Customers

The third and final workshop attempted to integrate the previous two, aligning products and services and potential follow-on entities. Some continuity was lost with a rotating group of participants but attaining a common baseline of program knowledge was a useful end in itself. The third workshop did support the refinement of the SM21 transition vision, mission, and goals. The business planning in terms of value proposition, projections and priorities were somewhat handicapped since the Dole Foods use case associated with the deployment of the GTMS was still ongoing during the workshop. Therefore, the value stream analysis could not be validated as a part of the

workshop. This lack of validation hampered the discussion from the perspective of identifying transition channels and channel drivers since the GTMS is the primary SM21 transition capability. Absent the final operational testing results from the Dole Foods extended User Acceptance Test, the group found it difficult to structure their strategic planning efforts, and the development of a business model proved even more challenging. See Figure 25 – Transition Workshop III: Strategic and Business Planning.

All-in-all the workshops proved helpful in educating and sensitizing the entire SM 21 team to the transition imperative, instilling a sense of urgency with the principal ONR contract expiring, and the need to complete necessary research in order to monetize the results. They established an internal ongoing dialogue and understanding of the need to incorporate transition planning into every ongoing element of the program in order to be successful.

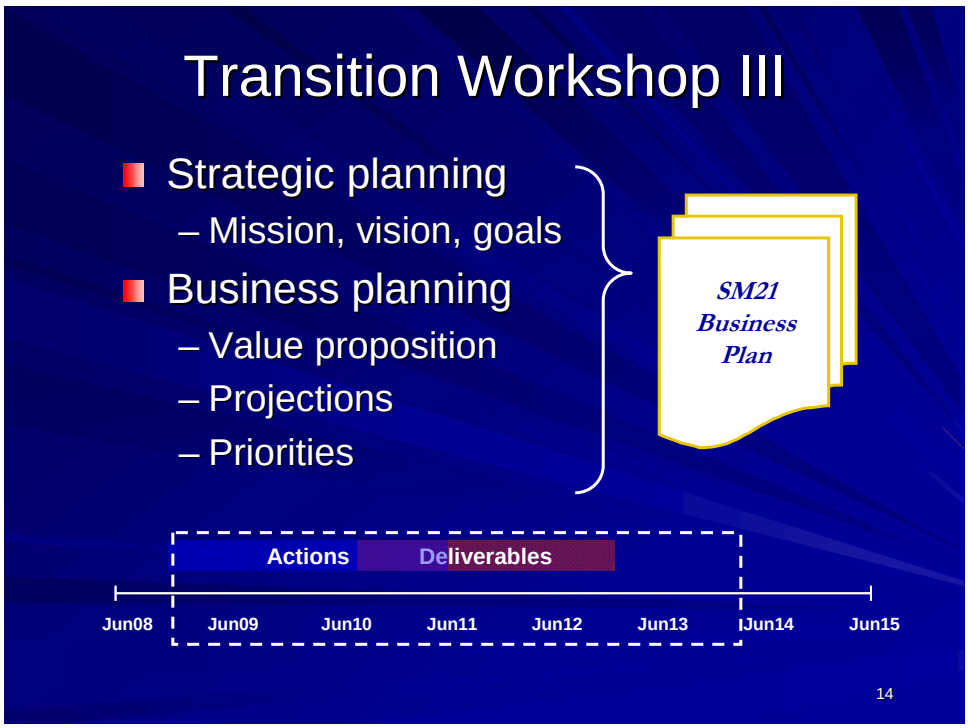

Figure 25 – Transition Workshop III: Strategic and Business Planning

Concepts and Capabilities: The Transition Selection Process

As the first step in determining what products or services would be sufficiently mature for deployment and transition, the SM21 team reviewed the suite of technology developed. The results of the review were then compared to the known commercial supply chain deliver function requirements and the standards associated with a military Joint Capability Technology Demonstration (JCTD).

Outside the Transition Workshops, an independent review was conducted on November 8, 2008 by a consultant well versed in positioning capabilities in startup and established entities and then positioning those entities for private placement by defense and commercial contractors. The zero based review was instructive in evaluating, developing and packaging various capabilities for incorporation into a new or existing entity.

The independent review focused on the following factors for each SM21 "Duck" to determine if it is a "Swan":

- Funding - Customer funding availability and certainty.
- Ability to Execute - Ability of the SM21 technology to resolve identified customer pain point.
- Capture Capability - Agility and ability of SM21 to capture the opportunity.
- Competition - Possible Competitors.

Far and away the number one swan identified was the Global Transportation Management System (GTMS) providing an end-to-end dual-use deliver function web services. Other ranked products and services included modeling and simulation, including business process reengineering and management, education and training and regional transportation planning.

Appendix B – The Joint Deployment and Distribution Support Platform

JDDSP Evolution to the Future Global Distribution Management System

The current JDDSP design is planned to be expanded over time to a Global Distribution Management System built upon a common semantically enabled IT enterprise platform. The entire network could be monitored by a network operations center (NOC) at a secure facility and an integrated service bureau managed by a Fourth Party Logistics Services Provider under contract with DoD. The proposed first steps in the process of implementing this network capability include:

- Validation of the underlying GTMS SOA collaborative web service backbone as a surrogate for an end-to-end - fort-to-foxhole network capability;
- Development and deployment of SM 21 Inc. 4PL Operating Plan (including Public Private Partnership PPP) and Level Six Logistics 3PL Business Plan at one or more venues (Southern California Logistics Airport, Cecil Commerce-JAXPORT, or Fort Gillem);
- Deployment of a prototype collaborative regional web portal (based upon Port of Genoa model) supported by a logistics Community of Interest and Practice (COIN-P) to support collaborative regional transportation planning, based upon agile supply network modeling and simulation, and distributed web services;
- Deployment of semantically enabled federated service oriented architecture (SOA) supporting the Global Transportation Management System (GTMS) Platform;
- Deployment of a public-private registry of Universal Description, Discovery and Integration (UDDI), a platform-independent, Extensible Markup Language (XML)-based registry for businesses worldwide to list themselves on the Internet;
- GTMS version 2.0 will incorporate Global Trade compliance, order cycle, and warehouse management system compatibility.

The steps outlined above would be followed by the first phase of a public-private partnership governance agreement through cross-marketing agreements with the selected Base Realignment and Closing (BRAC) Local Reuse Authority (LRA), or with joint use airport-rail authority and site master developer. [21]

[21] The GTMS version 2.0 will activate the currently disabled semantically enabled architecture to accommodate Rich Data Format System (RDFS) meta-data files based upon a Joint Logistics ontology and the concurrent expansion of the GTMS capabilities.

Additional expansion of the JDDSP capabilities would include the following steps:

- Deployment of the Anylogic version 2.0 Regional Agile Supply Network simulation model as a web service following:
    - The associated node-arc road and rail network and process mapping of port and marine terminal facilities, intermodal rail facilities, the inland JDDSP, and regional warehouse and distribution facilities;
    - Onboarding of attribute data for a regional military force deployment scenario (e.g. 101st Airborne deployment from Fort Campbell through JAXport Blount Island; reset/retrograde through JAXport to Anniston Army depot, and Humvees to Oshkosh, WI, the original equipment manufacturer (OEM), by combined road and rail).
    - During the development of GTMS version 2.0, the possibility of adding intelligent agent social network autonomic capability to the regional modeling and simulation will be explored.

- Establish a partnership with a Foreign Trade Zone FTZ to integrate trade compliance and cross-platform data mining, and continue exploring a partnership with PierPass maintained by the West Coast Terminal operators, to potentially host a prototype regional dray track and trace and scheduling and appointment system web service.

- Activate an SM 21 supported collaborative research and development consortium to conduct further JDDSP proof of concept and DOTMLPF joint experimentation and validation, (e.g. cold chain consolidation/deconsolidation facility development and unit train prototype at Fort Gillem. Additional experimentation may include the DoD Surface Deployment and Distribution Command (SDDC) Defense Transportation Coordination (DTCI) System integration with the GTMS to enhance reset/retrograde shipment management as part of Joint Logistics Education Training Test-bed, (JLETT)).

- Deploying JDDSP physical attributes, including 3PL service providers (pre-marshaling staging, consolidation/deconsolidation, cold chain, air-surface integration, and logistics buffer services).

- Conducting individual shipper distribution network Business Process Re-Engineering (BPR) and Business Process Management (BPM) based upon an instantiation of the regional agile supply chain network model-simulation.

- Deployment of instantiation of Inland Port Multi-modal Terminal Operating System (IP-MTOPS) integrating air and surface shipment tracking and tracing and exception management at multi-modal JDDSP sites, such as Fort Gillem-Hartsfield International Airport, as an initial prototype.

- Deployment of an instantiation of the regional track and trace and dray scheduling and appointment system to be developed and deployed by SM21 Inc.

- Deployment of the JLETT education and training capability through a regional partnership and national consortium under a master articulation agreement for credit and certificate of global logistics training.

- Extension of nodal connectivity linking and integrating individual JDDSPs following STRANET and STRACNET driving lane density through DTCI military and commercial load consolidation into a single green freight E corridor network supported by a secure network operations center (NOC).

- Knowledge Management System enabling data fusion through semantically enabled, ontology driven and automated, freight and transportation data warehouse. The system would be designed to enable analysis, decision support and data services, business intelligence, and regional transportation planning support services.

Appendix C - Human Capital Development

The Human Capital Development demonstration ('pilot') was designed to test the concept that the adjacent interests and resources of regional organizations can be aligned to train and employ workers. Essentially, all the ingredients for employment may be present, but the organizations are not aware of each other. In that case, an 'enabler' may be useful in connecting the parties and coordinating their activities to produce employed workers. Associated with these activities is the need to track this 'human capital' for the benefit of all participants.

The HCD pilot identified four primary roles in a regional community, as illustrated in Figure 26:

1. Opportunity. Businesses compete to hire qualified employees for technical positions having defined skill standards and certification requirements, and retain them for professional growth into more responsible positions;
2. Capacity. Community academic institutions offer professional vocational/technical training to prepare students for employment in a variety of industries;
3. Funding. Governments strive for the economic development of their regions, and actively encourage the development of employment in their regions;
4. Potential. Prospective employees desire to be employed in positions that offer the potential for professional development and upward mobility.

Yet these players do not necessarily make a community, and a fifth role is needed: an enabler. The SM 21 Inc. program –the logistics education and training fourth party logistics (4PL) service provider- in its social enterprise role would fulfill this position. The enabler performs these functions for the community:

1. Connect the players, reveal their shared interests and opportunities, and assemble them into a team; and
2. Coordinate their activities by interpreting policies and practices, facilitating transactions, and solving problems.

The planned HCD pilot was centered in Victor Valley, California. This location offered the following advantages for both the HCD project and the associated COI study:

1. Prior discussions with the principal players revealed a shared interest to participate in the training opportunity;
2. The players were already aware each other, but had not established working relationships; and
3. They were physically co-located, more conveniently permitting in-person meetings, as needed.

A key finding of the HCD pilot involved the nature of the transactions within the community needed to achieve the shared goal of producing employed workers. Although these transactions were two-sided, with each party giving and taking something of value, they were in most cases indirect: more than two parties were needed to complete any

transaction. Figure 26 – Roles and Transactions within Community of Interest illustrates the indirect nature of the transactions.

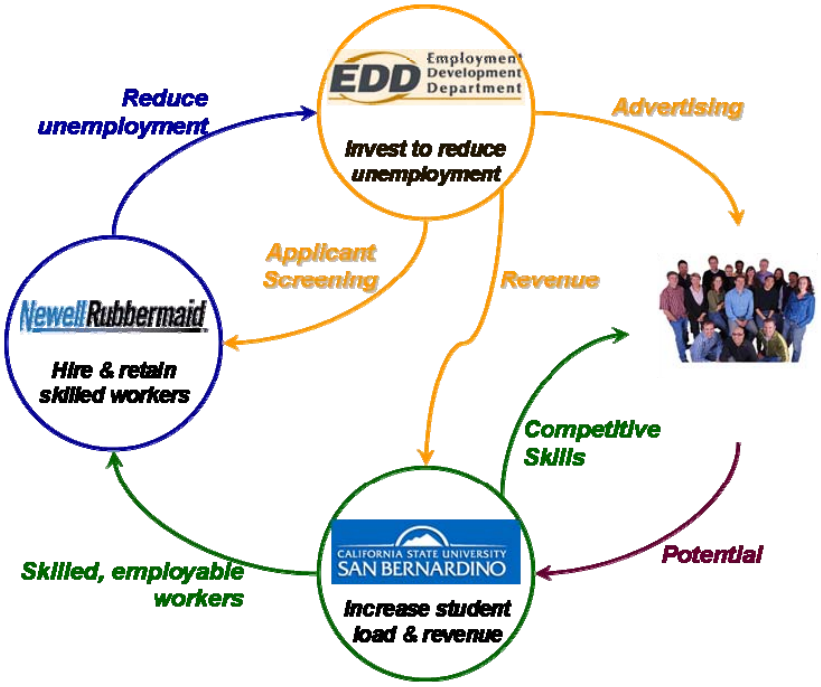

Figure 26 – Roles and Transactions within Community of Interest

The HCD project involves concepts and terminology that have generally-accepted usage and meaning. This section proposes several aspects of communities that guided the overall approach to the project.

Communities

There are subtle differences between a Community of Interest (COI) and a Community of Practice (COP) that are important qualifiers.

Community of Interest. The Defense Acquisition University (DAU) defines a COI as, "… any collaborative group of users who must exchange information in pursuit of their shared goals, interests, missions, or business processes, and who therefore must have shared vocabulary for the information they exchange."[22] By this definition the HCD pilot stakeholders represent a COI.

Community of Practice. Etienne Wenger first coined the term (and concept) in the late 1990's to describe "Groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly."[23] In contrast, the JDDE joint logistics stakeholders supporting the NDU CJSL collectively comprise a COP.

[22] 'Communities of Interest in the Net-Centric DoD, Frequently Asked Questions (FAQ)'. Retrieved on January 21, 2010, from http://acc.dau.mil/

[23] 'Communities of Practice.' Retrieved on January 21, 2010, from http://www.ewenger.com/theory/.

Two attributes emerge that are important to this project: having *something in common* and *some type of interaction*. Thus, communities can be related by geography (e.g. cities), by interest (e.g. music genre), or by purpose (e.g. environmental advocacy). The degree of community interaction can range from completely passive and random (the DAU terms as 'uncoupled'), to highly organized and coordinated ('tightly coupled').

Community members can be individuals representing themselves or – more likely in the scope of this research – organizations which are represented by individuals. In the latter case, communities composed of organizations must interact at both an individual and an organizational level.

Community Interactions

A community involves several types, or levels, of interaction that reveal the shared needs of its members. These levels are introduced in Table 1:

Content	Availability and accessibility of relevant information by members
Communication	Exchange of information among and between members
Collaboration	Members working together toward achieving shared goal(s)

Table 1 – Level of Community Interaction

Creating, nurturing, and maintaining a community requires member interaction, at varying degrees, at each of these levels. In time, these interactions become shared *practices* that will likely be unique to the community.

In turn, the interactions rely on individual behaviors, which may be influenced or constrained by a member's organization (the ability to release internal information and decision authority are examples). Thus each member likely brings two sets of behaviors – individual and organizational – into the community, and each must learn a new set of community behaviors. For this reason, the role of coordinating the development of, and member adherence to, community practices is critical to the success of the community.

Successful Interactions Require Coordination

The intensity of coordination (governance or oversight) a community may require depends on a number of factors. Among them is the risk of an unsuccessful outcome, the degree of commitment by the members, the complexity of the goals or of the tasks involved, and the degree of trust that exists between and among the members. The latter two factors stand out as the primary drivers of the intensity of governance needed in the community:

Complexity. The goals, and the tasks to accomplish them, may actually be complicated; an example is a software development project. However, even a task that is not inherently complicated may be challenging – and perceived to be complicated – if the

task (or practice) is new to one or more of the members. Members bring personal behaviors (instilled by their organization, perhaps) into the community; changing their behaviors to conform to a community practice may require closer oversight.

Trust. Generally, the need for coordination is lessened when the members trust each other. Within a community, trust involves credibility and familiarity. Credibility can be established quickly through a member's credentials, title or position, and organization. However, if members are new to each other, building familiarity to engender trust will take time. Until that occurs, closer oversight may be needed to facilitate interactions and resolve misunderstandings.

For a newly-formed community, the necessary coordination (or 'coupling') can, at least initially, be intense in order to foster community goals, interactions, and practices.

Establishing Community Practices

Tools are used to make work more effective, efficient, or to improve the product; they are added to existing work processes to improve the outcome. Before technologies can be introduced, and their utility demonstrated in a COIN-P, a community's practices need to be established.

Table 1 suggests that communities interact at three levels: accessing shared *content*, *communicating* information, and *collaborating* on shared goals. In turn, these interactions translate into distinct types of member activities on behalf of the community:

Informing	Creating awareness
Discussing	Creating understanding
Deliberating	Resolving alternatives
Deciding	Choosing a course of action

Table 2 – Member Activities in a Community

Community practices, then, consist of coordinated interactions that are performed through the activities of its members. For a new community, as in this project, the members bring individual practices with them. Though some *activities* may be common (or standard procedure) across communities – editing a document, for example – the community *practice* – compiling document edits – likely will not be. Therefore, establishing a set of practices that accomplish community goals requires an iterative approach and a degree of commitment and patience from the members.

Supporting Community Practices with Technology

Technological tools are used to support, and perhaps substitute for, existing work practices. To observe the utility of new tools it is also necessary to consider existing technologies members use to accomplish similar work. Examples are the telephone, fax machine, and in-person (face-to-face, or F2F) meetings, whether formal or informal.

More recently, a wide variety of technologies have become readily available in the workplace to facilitate community workflow. Many, particularly those of specific interest in this project, are very new, and the ways to use them productively in business are still being discovered. For this project, 'supporting technologies' is expanded to include existing, more basic means to conduct a community transaction. Table 3 lists and briefly describes the basic types.

Technology	**Functionality**
Face-to-Face meeting	In-person exchanges between two or more people
Telephone	Voice communication between two or more people
Facsimile machine	Document transmission by phone between dedicated machines
Email	Structured text messages between two or more people and transmitted over the Internet
Calendaring	A system of organizing and sharing schedules and events over the Internet
Linking	Creating and maintaining hyperlinks for faster access to web-based content
Web log (blog)	Publicly-accessible web page that allows visitors to add comments
Networking	Establish/record relationships among and between individuals with shared interests
File Transfer Protocol (FTP) Site	A web site (URL) that permits the exchange of files over the Internet
Wiki	A publicly-accessible web page that permits collaborative authoring
Instant Messaging	A form of real-time, text-based communication between two or more people using a common service (e.g. Yahoo Messenger, Google Talk)
Threaded discussion	An on-line discussion in which messages are shown in related groups, rather than chronologically
Internal search	A means to retrieve online community information (e.g. documents, web links)
Web Meeting Space	An online portal to conduct virtual meetings, usually offering video and audio streaming, file presentation and transfer, and

Technology	Functionality
	desktop sharing.
Media casting/ streaming	Distributing a digital media file over the Internet using syndication feeds for playback (casting) or for real-time rendering (streaming)

Table 3 – Technologies Supporting Community Practices

Product Choice and Technology Adoption

A decision 'to blog' or to 'use social networking' leads to the next series of choices. The variety of technologies is greatly compounded by the number of product offerings that are available to users. This variety can have a significant impact on the adoption of a technology by people, as illustrated in three examples:

1. Telephone. The range of brands (AT&T, Motorola, Panasonic), features (wired/wireless, frequency range, intercom, mute, message center, call blocking, etc.), and service providers (Time Warner, etc.) is daunting. A two-way call can involve completely different sets of brands, features, and service plans. Yet, these combinations do not prevent us from communicating. The telephone is a mainstream technology: people know how to call and receive, and their product choice is not a barrier to a successful outcome.

2. E-Mail. Like the telephone, e-mail (introduced in the early 1990's) has also become a mainstream technology for business users. Viewed as a utility, e-mail requires a similar set of product choices: the e-mail 'client' (the user interface; e.g. MS Outlook, Eudora, Gmail, Yahoo) and service provider (Time Warner, Verizon, Yahoo, Gmail, MS Mail). However, unlike the telephone, the user is then presented with a bewildering array of choices: e-mail address, send and receive protocols, filtering incoming mail, additional features (calendar, tasks, and contacts), attachment options, and e-mail management; how a user makes these selections differs by product.

   Learning basic e-mail proficiency is product-specific and can require significant investment of time. However, successfully completing a two-way e-mail (one that is received intact and not diverted as 'spam') is not only dependent user choices, but also the user's e-mail client (the application software), and e-mail service provider. Although e-mail has become mainstream, unlike the telephone, a user's product choice can be a barrier to a successful outcome.

3. Blogging. Web logs ('blogs') became popular among public users in the early 2000's, and have slowly found their way into businesses since about 2005. Where the telephone and e-mail enable two-way (including one to many) communications that are highly structured, blogging is relatively unstructured and can be adapted for a variety of purposes. Blogs are further distinguished by their potential audience; phone calls and emails are sent and received between specific people, while blogs – like websites (of which they are a form) – are exposed to the web and must be found by visitors.

From a blogger's (the owner of the blog) standpoint, there are two serious product choices: Blogger and WordPress. Though a blog can be created by either in five minutes, each is feature-rich and requires significant commitment to design and customize a site. Moreover, once created – and unlike a phone call or email – a blog requires continual maintenance and addition of new material to remain 'fresh' to the visitor. The cost to switch between blogging products is considerable.

Many of the tools listed in Table 3 also present brand or product choices, with each product requiring more than a casual understanding of how to employ it usefully. To the extent the members of a community already use these tools (in another community: work, socially, etc.), it is most likely that they each use (and may be loyal to) a different product. As a result, a decision to adopt one or more of these tools in a new community must confront a series of potential adoption barriers.

The Community Toolbox

None of the technology tools listed in Table 3 can adequately support all the interactions and activities that form the practices of a community. Moreover, a community's work involves varying degrees of controversy and demands for urgency. A *set* of supporting tools is needed.

Figure 27 illustrates how the choice of tool must fit the need, and also that community interactions can evolve and require a succession of tools.

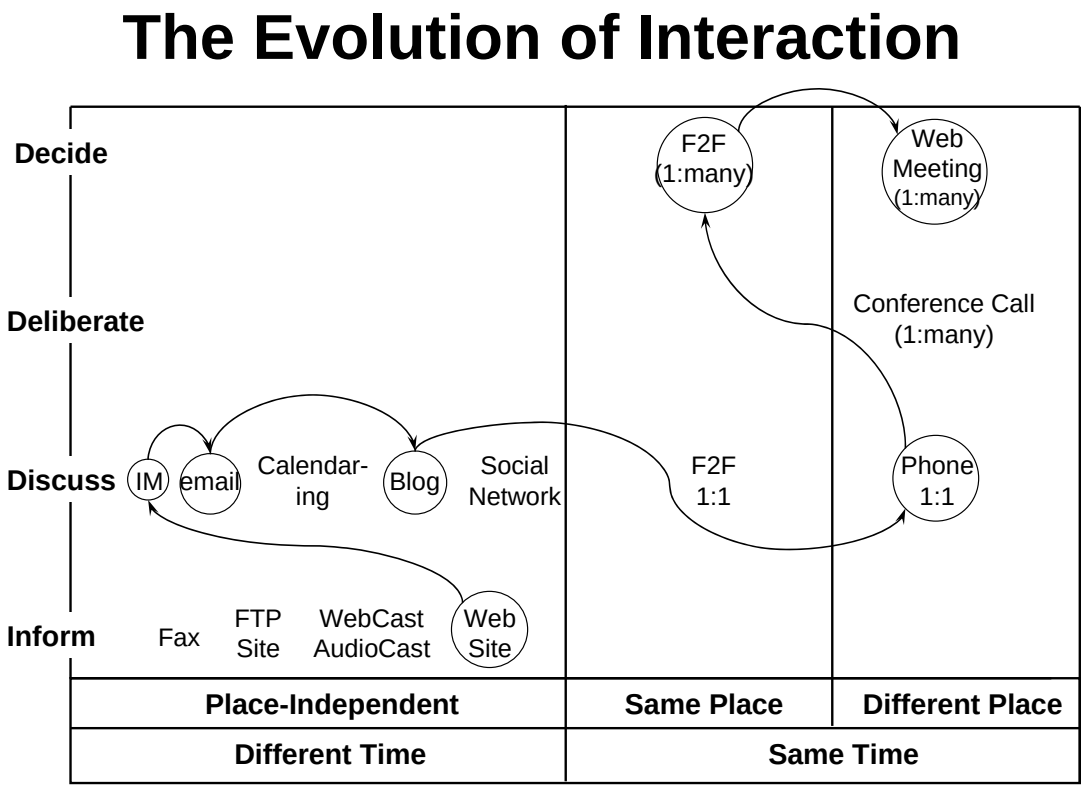

Figure 27 – Matching the Tool to the Need

As the transaction evolves, for example, from 'inform' to 'decide' the type of community interaction changes. It is important that someone in the transaction recognizes this and, as needed, shifts the forum to another tool. Notice also that, when the transaction involves deliberating and making a community decision, real-time communication is needed. This is also the case when a transaction must be addressed urgently.

A final note on Table 3: the tools are appropriate for the interaction (inform, discuss, etc.) shown and lower, but not higher. For example, e-mail is useful for both informing and discussing, but may not be for deliberating or deciding contentious topics.

Collaborative Portals

To this point, the discussion has isolated each technology tool. However, because community interactions can take place on several levels simultaneously, collecting a set of separate tools may not be a satisfactory approach and may even impede interaction. An alternative is an online portal that provides a virtual community environment with a series of integrated tools. IBM's SharePoint services and Microsoft's LiveMeeting are prominent examples.

A decision to migrate a community to an online portal can have a significant impact on the members. Working in an integrated environment facilitates the leveraging of multiple tools to accomplish a task. Additionally, having a dedicated environment can reinforce a sense of 'place' for members who are not as comfortable working virtually. However, these portals can be quite sophisticated and require members to learn new basic skills. Moreover, they require members to frequent a new, separate environment in addition to those they use at work or personally. Participation in multiple, simultaneous online environments is a difficult habit for some users to develop.

The HCD Demonstration COI Findings

The following findings are based on observations during the planning stages of the HCD pilot, and are organized in three broad categories: community formation, membership, and sustainment; practices and behaviors; and supporting technology.

Community Formation, Membership, and Sustainment

Finding 1: Community members. The community was comprised of one person each from four organizations in the Victor Valley, California. These were: California State University San Bernardino, the San Bernardino Economic Development Agency (Department of Workforce Development), Newell-Rubbermaid Corporation (Director of Logistics), and Strategic Mobility 21, Inc. (as community 'enabler').

Finding 2: Community viability and sustainment. The community did not form naturally, or through the shared interests of the members. Instead, its genesis was a business opportunity identified by SM21, Inc. Although the members collaborated effectively, their interactions were closely guided. After the employer postponed the scheduled training, the members did not continue to interact on their own.

Finding 3: Coordination and governance. All parties representing SM 21, Inc. were subcontractors and each represented a segment of the HCD pilot. No single contractor had governing authority over other participating contractors and although thorough

coordination was intended, there were occasions were a contractor made agreements or changes with the client, Newell-Rubbermaid, without all parties being made aware of the arrangements. This potentially gave the client the perception of a non-unified and uncoordinated effort that reflected on SM 21, Inc.'s business acumen.

Community Practices and Behaviors

Finding 4: Community transactions were complicated. The transactions needed to plan and conduct the HCD training were not straightforward. Rather, they were associative: party A gave to party B, party B gave to C, and C gave to A. Sensing the need for, and brokering, these associations was critical to the community's success.

Finding 5: Many community interactions were one-time only. Planning the HCD pilot involved transactions (e.g. establishing training requirements, funding flows, job vacancy announcements) that did not require repeating once established. As a result, member interactions did not become community practices, per se.

Finding 6: The project was time-driven (i.e. the training had to occur on a near-term date-certain basis), requiring deadlines and sequenced events. This, accompanied by the relative unfamiliarity among the members, required that the critical coordination be conducted in-person.

Supporting Technology

Finding 7: Phone and email were 'default' means of communicating between members. All members used phone and email in their own organizations, and these means naturally transferred into the community. HCD project deadlines and the scheduled sequence of member activities cautioned against disturbing these familiar methods.

Finding 8: Web presence. SM21, Inc. created a domain, sm21inc.org, a website and email addresses. A screenshot of the website is at Appendix A. The website was intended to create awareness, not to facilitate information sharing or collaboration.

Finding 9: Working virtually is a difficult individual behavior to instill, let alone adopt community-wide. For some members, e-mail and the telephone are the usual – and only – means of conducting business, and reinforced in their external (to the community) environments. Assuming all members are critical to the community, if only one chooses to not use a new means of communicating or collaborating, the community 1) risks alienating that member; or 2) will require parallel (new and old) practices.

Recommendations

To put this section in context, the original tasking for this project is repeated here:

> "… develop an SM 21 joint military and commercial community of interest and practice (COIN-P) pilot to facilitate and support SM 21 transition and capture of knowledge and lessons learned through modeling, simulation and analysis, joint experimentation and concept development into a web centric knowledge management system including capture, repository and delivery through various communication devices such as wikis, blogs, podcasts, seminars, etc. Both military and commercial user groups would be invited to participate. The use of other

professional symposia and workshops as technology transfer vehicles will also be explored."

Community Formation, Membership, and Sustainment

It is recommended that a follow-on project to create a community of practice be of limited scope. Further, instead of a business purpose (as was the HCD pilot), the community should be centered on one of the more mature research activities of SM21 (MS&A or joint experimentation or transition). In turn, the initial members should be chosen not only for their subject matter expertise, but also for their passion and technological receptiveness. The community can be expanded as practices evolve.

Community leadership should be assigned to one person who is experienced with the community subject matter, familiar to the members, and knowledgeable of community formation. Moreover, the members should be apprised of the project and asked for their commitment to try, and improve upon, the practices that are introduced.

Community Practices and Behaviors

The new community should start as a community of interest, with the expectation to evolve into a community of practice. This approach does not suggest there are clear differences between the two concepts; rather, it allows the members – who will be involved in activities external to the community – to 'grow' from information sharing to more active collaboration.

Additionally, the member interactions and activities should be generated by the members, rather than be imposed on them. The members will know best what subjects and issues are of greatest collective interest and importance to them, and will better ensure a sustained level of interaction.

Supporting Technology

Anticipating that telephone and e-mail will exist as common methods of communication, the community should start with simple ground rules for sharing information and documents. The community leader should initiate periodic group discussions, to facilitate familiarity and trust. The introduction of new tools should wait until the members are interacting routinely using these familiar tools.

New tools added should address a need identified by the members (e.g. too many e-mails, or version control of documents) and, ideally, be a product that at least one member has used previously. Additional tools should be introduced gradually and sequentially, recognizing that each requires a new set of member behaviors.

Appendix D – Technology Readiness Levels

The Technology Readiness Levels Defined

The Technology Readiness Levels are a set of nine graded definitions/descriptions of stages of technology maturity. They were originated by the National Aeronautics and Space Administration and adapted by the DOD for use in its acquisition system. A copy of the definitions is provided below for reference. The SM21 transitioning technology is considered to be in TRL 7.

Technology Readiness Level	Description
1. Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3. Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5. Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.

Technology Readiness Level	Description
6. System/subsystem model or prototype demonstration in a relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
7. System prototype demonstration in an operational environment.	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.
8. Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9. Actual system proven through successful mission operations.	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Clarifying Definitions:

- Breadboard: Integrated components that provide a representation of a system/subsystem and which can be used to determine concept feasibility and to develop technical data. Typically configured for laboratory use to demonstrate the technical principles of immediate interest. May resemble final system/subsystem in function only.
- High Fidelity: Addresses form, fit and function. A high fidelity laboratory environment would involve testing with equipment that can simulate and validate all system specifications within a laboratory setting.
- Low Fidelity: A representative of the component or system that has limited ability to provide anything but first order information about the end product. Low fidelity assessments are used to provide trend analysis.
- Model: A reduced scale, functional form of a system, near or at operational specification. Models will be sufficiently hardened to allow demonstration of the technical and operational capabilities required of the final system.

- Operational Environment: Environment that addresses all of the operational requirements and specifications required of the final system to include platform/packaging.
- Prototype: The first early representation of the system which offers the expected functionality and performance expected of the final implementation. Prototypes will be sufficiently hardened to allow demonstration of the technical and operational capabilities required of the final system.
- Relevant Environment: Testing environment that simulates the key aspects of the operational environment.
- Simulated Operational Environmental: Environment that can simulate all of the operational requirements and specifications required of the final system or a simulated environment that allows for testing of a virtual prototype to determine whether it meets the operational requirements and specifications of the final system.

GLOSSARY

Terminology	Definition
3PL	Third Party Logistics
4PL	Fourth Party Logistics Service/Solutions Provider
AAR	After Action Report
APS	Agile Port System
ASN	Agile Supply Network
BPM	Business Process Management
BPR	Business Process Re-Engineering
BRAC	Base Realignment and Closing
CCDoTT	Center for the Commercial Deployment of Transportation Technologies
CCDRs	Combatant Commanders
CJSL	Center for Joint and Strategic Logistics
CoB	College of Business
COCOM	Combatant Command
COE	College of Engineering
COI	Community of Interest
COIN-P	Community of Interest and Practice
CONOPS	Concept of Operations
CONUS	Continental United States
COP	Community of Practice
CSULB	California State University Long Beach
C-TPAT	Customs-Trade Partnership against Terrorism
DOD	Department of Defense
DoDAF	Department of Defense Architectural Framework
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and education, Personnel, and Facilities
DTCI	Defense Transportation Coordination Initiative
ERP	Enterprise Resource Planning
ETO	Expeditionary Theater Opening
FOC	Full Operating Capability
GAMS	General Algebraic Modeling System
GAMS/CPLEX	General Algebraic Modeling System / An optimization software package. named for the simplex method and the C programming language,
GDMS	Global Distribution Management System
GTMS	Global Transportation Management System
HA/DR	Humanitarian Assistance/Disaster Relief
HCD	Human Capital Development
ICD	Initial Concepts Document
IOC	Initial Operating Capability
IP-MTOPS	Inland Port – Multi-modal Terminal Operating System
ITS	Integrated Tracking System
J-7	Joint Training Directorate

JCIDS	Joint Capabilities Integration and Development System
JCTD	Joint Capability Technology Demonstration
JDDE	Joint Deployment Distribution Enterprise
JDDSP	Joint Deployment and Distribution Support Platform
JDDSP	Joint Deployment Distribution Support Platform
JDDSP IOC	Joint Deployment Distribution Support Platform Initial Operating Capability
JDDSP-OS	Joint Deployment and Distribution Support Platform-Operations System
JFCs	Joint Force Commanders
JFCOM	Joint Forces Command
JIC	Joint Integrating Concept
JL (D) JIC	Joint Logistics (Distribution) Joint Integrating Concept
JLETT	Joint Logistics Education Training Transformation (Test-bed)
JLETT	Joint Logistics Education and Training Experimentation Test-bed
JLETES	Joint Logistics Education, Training and Exercise Study
JOC	Joint Operational Concept
JROC	Joint Requirements Oversight Council
JWFC/J7	Joint Warfighting Center/Joint Training Directorate
KPI	Key Performance Indicators
LAR	Local Redevelopment Authority
LAR	Local Reuse Authority
MARAD	US Department of Transportation Maritime Administration
MATLAB	Matrix Laboratory
MOA	Memorandum of Agreement
MSA	Modeling, Simulation, and Analysis
NAS	Naval Air Station
NDU	National Defense University
NOC	Network Operations Center
OIF	Operation Iraqi Freedom
ONR	Office of Navy Research
P3	Public-Private Partnership
PACOM	United States Pacific Command
PEO's	Program Executive Offices
RDFS	Rich Data Format System
ROMO	Range of Military Operations
RTLS	Real Time Location System
SaaS	Software-as-a-Service
SBA	Small Business Administration
SCASN	Southern California Agile Supply Network
SCC	Supply-Chain Council
SCLA	Southern California Los Angeles
SCOR	Supply-Chain Operations Reference
SDDC	DoD Surface Deployment and Distribution Command
SDVSOB	Service Disabled Veteran Owned Small Businesses
SEASN©	Southeast Agile Supply Network

SKU	Stock Keeping Unit
SM21	Strategic Mobility 21
SM21 Inc	Strategic Mobility 21 Incorporated
SME	Subject Matter Experts
SOA	Service Oriented Architecture
SSTC	Smart and Secure Trade Corridor
STRANET	Strategic Highway Network
STRACNET	Strategic Rail Corridor Network
SWOT	Strengths, Weaknesses, Opportunities and Threats
TMS	Transportation Management System
TRL	Technology Readiness Levels
UAT	User Acceptance Tests
UDDI	Universal Description, Discovery and Integration
URL	Uniform Resource Locator
USD (AT&L)	Under Secretary of Defense (Acquisition, Technology & Logistics)
USJFCOM	United States Joint Forces Command
USTRANSCOM	United States Transportation Command
XML	Extensible Markup Language